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Oral communications

Effect of decorated MWCNTs by bismuth oxide nanoparticles on the thermoelectric properties of polypyrrole-based nanocomposites

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Abstract: Energy conversion and storage are nowadays essential aspects of the global energy strategy. About 90% of the energy comes from thermal engines powered by fossil fuel combustion [1]. This manufacturing process leads to heat production, wasted and not really exploited [1].Thermoelectricity appears as a promising way for heat conversion to electricity [2]. It is non-polluting process and relies only on the materials properties (thermal and electrical conductivities).The performance of thermoelectric (TE) materials is determined by a dimensionless value, called the figure of merit expressed by $zT=\sigma \times S^2 \times T/\kappa$, where σ and κ are the electrical and thermal conductivity, respectively, S the Seebeck coefficient and T the temperature. Another expression to quantify it, is the power factor $PF=\sigma \times S^2$ [3, 4]. The higher PF is, the better conversion is done. While inorganic materials are used since along time; Conducting polymers are nowadays emerging materials for this application since they have no toxicity, are easy to synthesize, and have relatively good electrical conductivity and low thermal conductivity. The present contribution relies on the synthesis of several materials based on polypyrrole (PPy) to which multiwalled carbon nanotubes (MWCNTs) and decorated MWCNTs by bismuth oxide nanoparticles (Bi2O3) have been mixed. Pure PPy was chemically synthesized via in-situ oxidative polymerization using FeCl3 as an oxidant and sodium dodecylbenzene sulfate (SDBS) as a dopant. To obtain MWCNTs-Bi2O3, MWCNTs were purified, functionalized using diazonium chemistry, and impregnated with ammonium bismuth citrate (ABC) as a precursor for bismuth particles after that annealed to convert bismuth into bismuth oxide [5]. Furthermore, PPy/MWCNTs and PPy/MWCNTs-Bi2O3 were elaborated (1:0.2, mass ratio) by insitu polymerization of pyrrole on MWCNTs surface. FTIR and TEM have used to characterize the structure and morphology of the elaborated materials. TE properties were evaluated by measuring the electrical conductivity, the Seebeck coefficient and the power factor. Among the prepared materials, the highest power factor is obtained at room temperature for PPy/MWCNTs-Bi2O3 nanocomposite, at about 0.9 µV/K. Compared to pure PPy and PPy/MWCNTs, this result is superior to both, which are 0.07 µV/K and 0.2 µV/K, respectively, which is also above the reported values [6].

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Numerical determination of p-n junction based cell parameters, using the forward I-V model

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Abstract: The extraction of solar cell electrical parameters like the ideality factor (n), the saturation current (Is), the parallel resistance (Rsh) and the series resistance (Rs) remains a serious and actual problem. For a good understanding of the device operation and its performances, these parameters are to be determined as precisely as possible. These parameters give a first idea of the conduction phenomena. Several methods have been proposed to extract these parameters from the experimental current-voltage (I-V) curve [1-5]. There are methods which uses auxiliary or artificial functions, deduced by transformations of the Shockley formulation of the current-voltage characteristic of a diode. In this work, we present a simple and purely experimental method using an external resistor, connected in series with the sample studied. The use of such external resistors has been already proposed in Ref. [5] but, in addition, authors propose the use of mathematical functions to extract the solar cell parameters. Our technique needs only one resistor and two (V, I) points from the I-V curve, in the presence and without external resistor.

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Using Multi-Layer Perceptron (MLP-ANN) Neural Networks Predicting the Thermal Conductivity of R-1233zd (E) Refrigerant

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Abstract: This work aims at developing an artificial neural network to describe the thermal conductivity of one system of R1233zd (E) refrigerant using Multi-Layer Perceptron (MLP-ANN) under different conditions. In this regards, a total of 216 data points at several temperatures (313.3 to 474.21) K and pressures (0.15-4.10) MPa. The application of this model for these 116 data points of refrigerants allowed training, validating and testing the model. This study showed that ANN models represent an excellent alternative to estimate the thermal conductivity of this system. The squared correlation coefficients of thermal conductivity predicted by ANN were R2 = 0.9990 as well as a high robustness with a good level of accuracy of RMSE =0.0013.

Analysis of a GaSb/AlAsSb/GaSb based thermophovolatic cell : Effect of the of the AlAsSb barrier characteristic.

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Abstract: For the thermo-photovoltaic conversion, we choosed to analyze performances of a semiconductor based double junction or a p-B-n based design cell. The element (B) is a large gap barrier, p and n being two layers made from the same material and doped Na and Nd, respectively. A good choice of the barrier is important since it plays an important role in the device operation and the structure's performances. In this work, we simulated the effects of the thickness and the doping of this layer, made of the AlAs0.6Sb alloy. The two other elements of the cell being the GaSb (p) for the contact and the GaSb (n) for the active region. The simulations showed that the current-voltage characteristic under illumination (Jph-V) is slightly improved when decreasing the thickness of the barrier. For a thickness of about 30 nm, (Jph) is around 1.52 mA/cm2 under -0.6 V reverse bias. Under the same bias, it is of about 1.46 mA/cm2 for a 150 nm thick barrier and. The photovoltaic parameters of the cell increase with the doping of the AlAsSb layer, except the open circuit voltage (Voc). The external quantum efficiency (QE) also increases with doping and for both thicknesses. The best result for (QE) was obtained for the 150 nm thick barrier.

GaSb-based p-n homojunction for TPV conversion : Effect of p-GaSb base layer characteristics.

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Abstract: Gallium antimonide is one of the ideal semiconductor materials used in thermophotovoltaic conversion due to its physical properties, especially its low energy gap0.72 ev.The aim of our work is to optimize the performance of an n-GaSb/P-GaSb homojunction by performing a numerical simulation with the PC1D 6.2 solar cell software. We have studied the effect of doping for concentrations ranging from 1015 to 1017cm-3 and thicknesses varying between (0.5 -2um) of the P GaSb base layer under two light sources: monochromatic source (1000-3000nm) and black body (1500K). For this structure the maximum values of JSC = 26.86 mA/cm -3, VOC = 0.3038 v and FF= 80.32 % are obtained for the 1016 cm-3 doping which presents a maximum conversion efficiency of 6.554%.

Enhanced mid-infrared gas absorption spectroscopic detection using Multilayer Vertical Optical Structures

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Abstract: Light has significant advantages over electric current It passes through a dielectric medium faster than electrons in conducting media. Despite these advantages, optical circuits are not used on a large scale. The main reason is the absence of a material, equivalent to semiconductors, for photons [1]. Porous germanium (GeP) seems to be an excellent candidate for the realization of such structures. Its dielectric properties have been extensively studied from both fundamental and technical points of view. It has been demonstrated that thanks to the relationship between the current formation density and the porosity, it is possible to realize structures with a periodic profile of the dielectric constant. It is, therefore, possible to realize two-dimensional photon gap structures in the direction parallel to the formation plane of the porous silicon [2,3]. The propagation of waves in a homogeneous medium, whatever the type, always results in a spread of the wave packet and thus a dispersion of energy [4]. It is therefore essential to be able to channel the light beam. An example of a structure that allows creating confinement of the photons is given by a periodic stacking of dielectric layers of thickness of the order of the wavelength of the light. Such structures have remarkable optical properties: high wavelength selectivity and almost 100% reflectivity over a wide spectral range [5]. Semiconductor technology has made it possible to obtain high-quality Bragg reflectors from III-V materials [6]. In this case, the index modulation is obtained by modifying the concentrations of the materials used. Semiconductor-based microcavities have two main interests. On the fundamental level, they allow a study of the matter-radiation interaction, for example, the exciton-photon coupling obtained by placing a quantum well in the center of the microcavity. In terms of applications, they are very promising for the realization of emitting structures with a low threshold of stimulated emission [7]. We will see that it is possible to realize vertical modulations of the optical index in porous germanium.

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Contrubution to Enhancing the Functionality of Orgnaic Cells: Aplication on Grätzel Cells

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Abstract: Lately, photovoltaic solar energy has become the most promising energy source among renewable energies. The increase in efficiency in the solid-state version of DSSCs from about 5% to over 15% have been reported within two years of time scale. In particular, the main challenge may be the organization of donor and acceptor materials in about 5% to networks inside the DSSC and the elimination of electrolytes leakage. It is in this spirit that we were interested in developing a reliable experimental protocol to enhance the efficiency of our DSSC. The aim of this research work is the realization and characterization of Grätzel cells based on twelve natural dyes sensitizers from different categories (plants/trees leaves, fruits and vegetables, flowers, and spices). The coated semiconductor on the substrate (ITO) inside the photoanode was deposited by two techniques, the doctor blade and the spin coating method. We have tested nine deposited layers of titanium dioxide. Regarding the electrolytes, we tested eleven solutions based on iodide/triiodide redox couple. For the final component we have putted a graphite pencil onto the counter electrode. Our results were obtained by the use of following characterization techniques: the XRD, EDS, spectrophotometer, SEM, solarimeter, digital multimeter, and multiparameter HI 2030). We have found that the eucalyptus extract based on ethanol and acetic acid showed good absorbance, a range from 750 – 790mV for the VOC, a range from 3.100 – 3.135mA for the ISC, and a range from 1.045 – 1.452% for the efficiency η. The I–V characteristics curves of the fabricated cells were carried out. The photoelectrochemical performance of the DSSCs based on the selected eucalyptus dye diluted with capsaicin showed the highest VOC; we measured a value of 790mV. Thus, the DSSC sensitized by this extract exhibited the highest conversion efficiency of 1.452% among the twelve extracts.

Theoretical investigation of sensitive photonic crystal blood cell sensor in NIR-IR

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Abstract: Biosensing is an emerging field for detecting biochemical interactions using electrical, optical, calorimetric, and electrochemical transduction systems. These transduction mechanisms are used to translate changes and variations in the biological domain into a readable and quantifiable signal. Biosensors are particularly used to detect various biological targets, such as cells, bacteria, viruses, proteins, hormones, and enzymes, to facilitate disease diagnosis. One-dimensional photonic crystal (1D PC) is spatial periodic artificial micro and nanostructures with various refractive index and permittivity materials. They have a peculiar Photonic Band Gap (PBG) property. PBG is the region in which the existence of light is forbidden within a specific range of optical wavelengths/frequencies [1], [2], [3, p. 2]. PCs have attracted researchers in the area of photonics since 1987 [1], [2]. The analogy of PBG property was arisen due to the similar behavior of the electron's diffraction in semiconductors and photons diffraction in PCs [1], [2]. When a defect layer is immersed in the 1D-PC, a transmission resonant peak appears inside the PBG, and its position is a function of the RI of the defect layer [1]. The 1D-PC is very sensitive to the refractive index of the small defect layer due to the strong confinement of the incident electric field [4], [5]. Due to the refractive index variation, there is a rapid response in reflectance and transmittance spectra [5]. In this paper, we have investigated theoretically the effect of blood samples on the performance of defective 1D PCs composed of alternating silicon (Si) and Fused Silica (SiO2) layers using the transfer matrix method (TMM). The defect used here is polystyrene (PS) polymer. Further, we analyze the influence of variation of defect layer thickness, incidence angle, and a number of layers on the performance of the defective 1D PCs. To enhance the performance of the biosensor, we are using the optimizing process and achieving the best sensitivity of 1300nm/RIU for our blood sensing device.

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Thermal, optical and spectroscopic characterization of a semi-conductor polymer PMMA doped with ZnO

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Abstract: The objective of this work is to make a study of the cooling by Poly(methyl methacrylate) PMMA organic polymer materials doped by a manufactured ZnO semiconductor. We divided our work into two parities: The first one presents an experimental study on the fabrication of ZnO and the the second concerns an experimental study on the organic polymer PMMA, we used THF-soluble PMMA doped with ZnO to improve its thermal conductivity. An experimental analysis and characterization by DSC, FTIR, SEM and PL, on the rate of doping and on the efficiency and functioning of the materials are examined. Photoluminescence shows that the greater the quantity of ZnO, the electrical conductivity of the material and the electrical efficiency of the cell are important. The DSC shows that there is a relation between the thermal conductivity, the specific heat and the latent heat when one increases the thermal conductivity with the injection of the nanoparticles of semiconductor ZnO, the latent heat increases. SEM scanning electron microscopy characterization shows that the morphology of our layer is uniform, homogeneous and compact with the presence of some irregularities. For Fourier transform infrared spectroscopy (FTIR) we conclude that there are no new peaks except for PMMA and ZnO, so we confirm that there are no chemical reactions between PMMA and ZnO. And as perspectives and future work we try to focus on the cooling of solar cells by polymer materials and storage by its latent heat and development of new semiconductor polymer materials.

Development of CuInSe2 (CIS) thin film on FTO substrates by electrodeposition (ED) process for photovoltaic application

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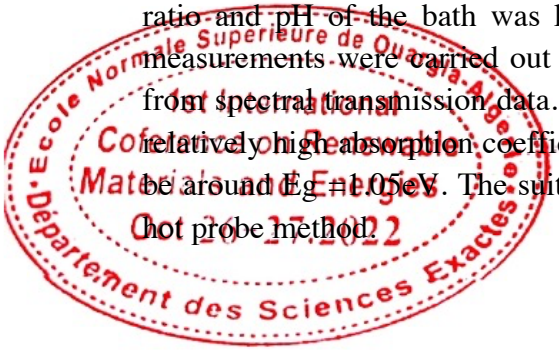
Abstract: In this work, solar cells chalcopyrite CuInSe2 (CISe) thin films are prepared by electrodeposition technique (ED) on FTO/glass substrates using an aqueous bath containing Copper chloride (CuCl2), Indium chloride (InCl3) and selenium dioxide (SeO2) in appropriate ratio and pH of the bath was kept at 2 using few drops of Hydrochloric acid. The optical measurements were carried out in the [400-1600 nm] wavelength range and were determined from spectral transmission data. Optical measurements showed that the deposited layers had a relatively high absorption coefficient of 104 cm-1 and the direct energy band gap was found to be around Eg =1.05eV. The suitable p-type conductivity of CISe thin films was confirmed by hot probe method.



Ba doping effect on the PZT as perovskite material structure

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Abstract: PZT is Perovskite materials can be made in various crystallographic forms, depending on composition, and these forms control the consequent electrical and physical properties. In general, it adopts a variation of the well-established perovskite structure with the basic stoichiometry ABO3, where the Pb2+ ion occupies the A site and both the Zr4+ and Ti4+ ions share the B site[1] In earlier studies, PZT materials have been prepared with various dopants such as La3+, Bi3+, Nd3+… as donor dopants on the A site, substituting for Pb2+, and Nb5+, W6+, V5+... substituting for Ti4+/Zr4+ on the B site. For instance, improved dielectric and piezoelectric properties were achieved in ceria-doped (A site) PZT and niobium-doped (B site) PZT materials. Similarly, A-site doping with Ba2+, Cd2+ and Sr2+ showed enhanced ferroelectric and piezoelectric behaviour[2]. These materials have been prepared by different methods such as chemical coprecipitation, mechanical alloying, hydrothermal method, conventional solid-state reaction and sol-gel method[3]. The problem is to reduce the rate of lead in the structure because of its toxicity. In this concept, we are interested in this study to the preparation by the sol-gel method of perovskite materials based on Ba-doped PZT. The objective in this work, is to obtain the pure perovskite structure. This study focuses on the different Ba concentrations in order to obtain the perovskite structure without undesirable phase for a calcination of 1000°C. The obtained materials are characterized by X-ray diffraction (XRD), Fourier Transform Infrared Spectroscopy (FTIR) and Raman Spectroscopy.

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Applied Control technologies for Three-Phase Shunt Active Power Filter

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Abstract: Electrical grids have encountered a wide spread of non-linear loads that are using power converters based on semiconductors. This leads to power quality deterioration due to the harmonic currents generated by this type of load. Therefore, many researchers promoted the use of active power filters to reduce the effect of these harmonics. This paper presents a comparative study between control strategies for an active power filter using the MATLAB / SIMULINK environment.

A Comparative study between MPPT using PI and Fuzzy Logic Control for Wind Turbine system

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Abstract: This paper studies the modeling and control of a variable speed wind energy conversion system (WECS) based on Permanent Magnet Synchronous Generator (PMSG). In order to enhance the efficiency of the wind turbine system, the maximum power point tracking (MPPT) control is integrated for exploiting the maximum available power from the wind. Two types of controllers have been proposed and developed, PI and Fuzzy Logic Control (FLC). Simulations results using Matlab Simulink show the performances of each one with a comparison of results.

Enhance the thermal and energy efficiency of a Primary school in the Wilaya of Ain Temouchent by concentrating on solar gains

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Abstract: The building sector accounts for 30% to 40% of annual global energy consumption, and this percentage keeps on increasing with the needs and demands of humans. The building envelope it's a crucial factor to reduce the building energy demand, especially in heating-dominated climates. Hence the need to choose the appropriate construction materials is more important because of the desire of the inhabitants to ensure thermal comfort. This theoretical work focuses on the thermal aspect of the design of the building envelope and the type of glazing to determine the best configuration for the energy efficiency of the building of a primary school located in the city of Ain Temouchent (Algeria). By studying, monitoring and analysing the nine configurations we applied in the building envelope in terms of energy and thermal comfort. The numerical simulations were implemented using the TRNSYS thermodynamic simulation program. The results show the second case is the best solution in terms of consumption. Moreover, it is the simplest and the cheapest. But using the eighth case with some modifications might be better.

Fatty acid methyl ester (FAME) synthesis using response surface methodology (RSM): a case study using used frying oil

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Abstract: Numerous researchers have investigated the synthesis of biodiesel from used oil under various circumstances and goals in an effort to recover energy and lessen environmental problems. In this context, Tunisia is one of the countries that suffer from those problems. Yearly, it consumes about 170,000 tons (about 17 kg/ person) of vegetable oils. Indeed, the most frequent sources of used oil wastes are restaurants, housing facilities, university restaurants, hospitals, and refectories. Accordingly, the present study is focused on the synthesis of fatty acid methyl esters from this waste, using potassium hydroxide (KOH) as catalyst under different transesterification conditions. Indeed, Response Surface Methodology (RSM) has been used. The studied factors were methanol to oil molar ratio (X1), reaction time (X2), and the initial catalyst weight (X3). However, both reaction temperature and mixing rate were constant. The findings revealed that the three studied factors have considerable impacts on biodiesel yield. Fixing temperature and mixing rate value have no critical influence on the effectiveness of having adequate mathematical simulation, according to the statistical results of this study. Based on the analysis of variance (ANOVA), the molar ratio was found to be the most significant factor. Besides, a second-order model with R2 = 0.88 was obtained to anticipate the response yield. It is also found that different ranges of X1, X2 and X3 can be used to obtain an optimal biodiesel yield.

Synthesis of Sulfate-doped Silver Carbonate SO4-Ag2CO3 with Enhanced Visible Light Photocatalytic Activity

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Abstract: The development of a photocatalyst material able to be active under visible light is of a great interest in that it can be used for removing organic pollutants from aqueous media under solar irradiation by an oxidation process that uses an abundant and free source of energy. Indeed, this interest is due to the fact this approach, based on the use of a natural, renewable and inexhaustible resource, is part of the green and clean technology. In this framework, this study aims at presenting the successful synthesis, multiscale characterizations and the evaluation of photocatalytic activity under visible light towards the removal of Orange G model dye from aqueous solution of a sulfate-doped silver carbonate. Structural, microstructural, chemical composition, and optical properties of the prepared samples were characterized using XRD, FTIR, SEM-EDS, and UV-Vis DRS respectively. The assessment of the visible photocatalytic properties of the elaborated pristine and doped Ag2CO3 materials was fulfilled by measuring the decomposition rate of OG in presence of the photocatalyst. The elaborated SO42- doped Ag2CO3 photocatalyst was found to exhibit remarkable enhanced photocatalytic activity under visible light irradiation since it completely decomposed OG in 30 min. Its degradation rate constant was more than two time higher than that of pristine Ag2CO3. This performance was likely due to the fact that Ag2CO3 lattice doping with SO42- improved the separation efficiency of photogenerated electron-hole pairs and prevented recombination, which accounts for the strong photocatalytic activity

Maximum Power Point Tracking of Wind Energy Conversion System using Sliding Mode and Backstepping Controllers

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Abstract: In this paper, non-linear controls algorithms based on Sliding Mode controller and Backstepping controller are proposed to maximize the power extraction of a variable speed wind energy conversion system. In our work the wind power system contains several elements such as the turbine, the gearbox, and the shaft of transmission, so, we started our study by modeling all of them. After, in order to have maximum wind power, the wind system must be controlled. In the literature, we find two families of control structures for Maximum power point tracking: one control without mechanical speed control and the other with mechanical speed control. In our work we are interested in control with mechanical speed control by basing on two methods: a Sliding Mode controller and Backstepping controller for variable speed wind turbine. So, the main objective of this strategy consists in overcoming the existence of the chattering phenomenon which appeals in the case of sliding mode control with ensuring the same performances as response time, steady-state error, tracking reference. The simulation results, in Matlab/Simulink environment show that the proposed control techniques are able to maximize the energy extracted from the wind also demonstrate a good performances of the Backstepping control in reducing the chattering problem

Natural solar light activated NiFe2O4 photocatalyst as green process for the removal of naproxen from aqueous solution

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Abstract: Non-steroidal anti-inflammatory drugs represent one of the commonly used compounds and frequently found in municipal wastewater, surface water, groundwater and drinking water with concentrations in the range of ng/L to mg/L. The degradation of these persistent pollutants using conventional water treatment methods is generally incomplete. This work focuses on the elimination of naproxen from water using combined action between natural sunlight and photocatalyst as green process. NiFe2O4 Spinel Photocatalyst was prepared using simple one pot method. obtained powder was annealed in muffle furnace at 300 c° and 600 c° for 2h and 3 h respectively, structure, morphology, and size of the nanoparticles was determined using Powder X-ray Diffraction (P-XRD), Scanning electron microscopy (SEM), Fourier Transformed Infrared (FTIR) and band gap energy was determined using reflectance diffuse spectroscopy (RDS). After 90 min of reaction between natural solar light irradiation and photocatalyst; about 60% of naproxen was removed.

Photocatalytic removal of dyes in aqueous solution using semiconductors under UV

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Abstract: Heterogeneous photocatalysis using UV light is a successful process for the wastewater treatment due to the special capabilities of the catalyst to degrade and mineralize hazardous dyes. The present work deals with the adsorption and photodegradation of two dyes namely the Tartrazine (Trz) and Methylen Blue (MB). The comparaison between the efficiencies of the photocatalysis, on ZnO or TiO2, and adsorption onto activated charcoal, is reported. The photoactivity on ZnO exhibits the best efficiency with a degradation yield of 68 and 93% respectivly for TRZ and MB. The influence of the catalyst dose on the photodegradation showed that the increase of the ZnO amount improves the photocatalytic efficiency, due to the increased number of active sites for the production of •OH radicals. The photodegradation rates reached 90 and 100% for the TrZ photodegradation respectively with 0.1 and 0.2 g of ZnO while 56 and 94% yields were obtained for the MB photodegradation. The Total Organic Carbon analysis was used to follow the dyes mineralization to CO2, H2O and mineral salts and a pourcentage mineralization of 21 and 19% was obtained respectively for TRZ and MB. In fact, the total mineralization requires a longer duration comparatively to the photodegradation and must be sufficient to mineralize both the pollutant molecules and their intermediates. The photocatalytic process is well described by the Langmuir–Hinshelwood (L–H) model

An investigation of structural, electronic and magnetic properties of ferromagnetic half-metallic NaNiO3 using LSDA+U

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Abstract: The aim of this study consist to predict the structural, electronic and magnetic properties of perovskite oxide NaNiO3 using density functional theory and by considering the Hubbard correction (DFT+U).The exchange and correlation potential is treated by using LSDA+U approach implemented in wien2k code. The value of Hubbard term of NaNiO3 used for properties calculations is equal to U= 6.2 eV. The obtained results have indicated that NaNiO3 is more stable in the ferromagnetic phase and it have a half metallic character and his total magnetic moment is an integer equal to 5 magneton bohr. By analyzing the density of states curves, we can see that the behavior of the perovskite NaNiO3 is semi-conductor in the canal of minority spins with an indirect gap and we can see again a strong hybridazion between 3d-Ni states and 3p-O states near Fermi level. Finally, the NaNiO3 perovskite can be used in applications in the spintronic field.

Theoretical investigation of the mechanical stability of diamond-like materials under a pressure gradient

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Abstract: In this work, the mechanical stability of the quaternary semiconductors CZTX (X=S, Se) and CIITSe (II=Cd, Hg) is investigated using the Density Functional Theory (DFT). By employing the Plane Wave Pseudo Potential approach (PP-PW), coupled with the Generalized Gradient Approximation of Wu-Cohen (GGA-WC), the elastic constants are calculated for the studied materials at zero pressure and under hydrostatic pressure. Relying on the generalized Born stability criteria for the tetragonal systems, it is shown that CZTS and CZTSe are mechanically stable up to 12 GPa; however, CCTSe and CHTSe are mechanically stable up to 10 GPa. The obtained results may be considered as a fundamental contribution for possible technological applications of these compounds, in photovoltaic and thermoelectric conversion processes.

First Theoretical Study of The electronic and Magnetic properties of Mg0.75Co0.25S

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Abstract: In this theoretical work we are looking for a new diluted magnetic semiconductor material with good properties for use in optoelectronics and technological applications using the full-potential linearized augmented plane waves method with the local orbital FP-LAPW+lo we study the electronic and magnetic structural properties of MgS in ferromagnetic rock salt phase doped by Cobalt for x=0.25, the structural properties of Mg0.75Co0.25S are simulated by the WC-GGA method while the electronic and magnetic properties are simulated by the PBE-GGA method.The first results indicate that the compound Mg0.75Co0.25S is metallic in both spins with a high magnetic moment equal to 1.788 μB .

Design and analysis of an off-grid PV system in Ouargla city, Algeria using PVsyst software

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Abstract: Among all other incompatible energy sources, solar energy is an unending, unpredictable, and durable energy source. This study simulates the feasibility of installing an off-grid photovoltaic (PV) system to fulfill the electrical energy needs of a residential house located in Ouargla city, Algeria. PVsyst 6.88 software used as a tool to design and evaluate the performance of the proposed system. The daily energy consumption is about 26.8kWh/day. From the obtained results, the system has an average performance ratio (PR) of 0.721. The solar fraction (SF) of the system is 1.0, which means that the off-grid PV system completely supplied the load demand. The energy supplied to the user is 9779.6kWh/year, where a 459.8kWh/year of system energy is unused (battery full). The maximum electrical energy produced of the system was in July and August. Whereas, the observed highest losses of the system in this study are due to the temperature of PV field, which was 13.22%. This simulation work will be helpful in designing and evaluating off-grid PV systems in other locations by using the same method as described in this paper

Enhanced proton acceleration from materials of low Z

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Abstract: The proton acceleration through a femtosecond high-intensity laser irradiating a thin foil in target normal sheath acceleration (TNSA) [1] regime was investigated by two-dimensional Particle-In-Cell (PIC) simulations using EPOCH code [2]. The effects of thickness and composition of the used target to enhance the maximum proton energy are studied. The resulting energy spectra of forward accelerated protons from different materials (He, C and Al) and different target thicknesses (50, 200, and 500nm) indicates that the maximum proton energy is obtained with helium target. In this latter, more important quantity of laser energy is absorbed by the material, where it leads to the generation of relativistic electrons at the front side, which subsequently propagate and circulate within the target. These hotter electrons participate to increase the sheath field in the rear side of the target, which plays a major role to accelerate the protons to high energies. It is also observed that the proton acceleration is enhanced as the target thickness decreases for all the materials.

On periodic solutions for a first-order neutral delay hematopoiesis model

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Abstract: In the current paper, we discuss a neutral delayed differential equation which describes the production of different types of leukocytes in the bone marrow. The proposed model involves time varying delay and time and state dependent one. We mainly study the existence of positive periodic solutions via the Krasnoselskii's fixed point theorem together with the Green's functions method. Moreover, by the aid of the Banach fixed point theorem, we prove the existence and uniqueness of the obtained solution. Our outcomes complement some earlier ones.

Green synthesis of Silver nanoparticles by aqueous leaves extract of Thymus capitatus (Lamiaceae) : Effect of silver nitrate concentration on the type of product

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Abstract: In this study, green synthesis of silver nanoparticles (AgNPs) was achieved by bio-reduction of silver nitrate using Thymus Capitatus plant leaves extract. The effect of different silver nitrate concentrations on the nanoparticles' silver formation was studied. The obtained nanoparticles were characterized by UV-Vis, FT-IR, XRD and SEM techniques are used for this purpose. UV-Vis spectra showed maximum absorption in the range of 253–300 nm related to the silver. Fourier-Transform Infrared (FTIR) Spectroscopy was used to confirm the existence of various functional groups responsible for reducing and stabilizing during the biosynthesis process. The spectra result exhibit a two weak peak at 517 and 603 cm-1 attributed to silver NPs vibration, confirming the nanoparticles formation. The X-Ray Diffraction (XRD) analysis confirmed the crystalline nature of AgNPs with an average size ranged in 18–34 nm. SEM showed that the green synthesizing silver nanoparticles having in general as cubical shape. As a result, the use of Thymus Capitatus leaves extract offers its ease, fast, low cost and friendly to the environment compared to other methods. The synthesized AgNPs could be used in the fields of water treatment, biomedicine, biosensor and nanotechnology.

Investigation of Structural, Magnetic, Elastic and Electronic properties of quaternary Heusler alloy LiCaPO: first-principles study

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Abstract: In this work, we have carried out first-principles approach based on the density functional theory (DFT) and FP-LAPW method which is implemented in Wien2k package, in order to study the structural, magnetic, elastic and electronic properties of LiCaPO compound. The negative formation energy of this alloy in the stable phase (γ) indicates thermodynamic stability and it can be synthesized experimentally. The elastic constants show mechanical stability of the studied compound. Further, the band structure and the total density of states (DOS) reveal that LiCaPO compound is a half-metallic ferromagnet (HMF) with an integer magnetic moment (2) satisfied the slater Pauling rule. Curie temperature was also calculated using mean feald approximation, and it found to be 435 K. High Curie temperature and high spin polarization classify LiCaPO alloy as a new HMF material suitable for spintronic applications.

Phase stability, magnetic, electronic, half-metallic and mechanical properties of a new equiatomic quaternary Heusler compound VScRhSn: A first-principles investigation.

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Abstract: In this work, we present the results of the study of the structural, electronic, magnetic and mechanical properties of a new equiatomic quaternary Heusler compound (EQH). The study is performed using the Full Potential Linearized Augmented Plane Wave (FP-LAPW) method within the framework of Density Functional Theory (DFT). The electronic exchange-correlations energy is described by generalized gradient approximation (GGA) with Perdue-Burke-Ernzerhof (PBE) exchange correlation functional. The calculations were achieved for three types (Y1, Y2, and Y3) of Heusler compound VScRhSn. The results of optimization clearly showed that the Y-type-1 structure in the ferromagnetic phase was more stable than others for the compound studied, the lattice constant value obtained is 6.4382 Å. The mechanical properties of the VScRhSn compound are predicted from the calculated elastic constants, the results indicated that this compound is mechanically stable and have ductile nature. The formation energy of VScRhSn, calculated in the Heusler structure is negative, which confirms its stability. The electronic properties showed that the compound is ferromagnetic half-metallic, it exhibits a band gap of 0.59 eV in the minority spin channel and has an appreciable total magnetic moment of 3μB and a complete spin polarization of 100% at the Fermi level, which makes it attractive for applications in spintronic devices.

CFD based performance analysis on Air Heating Solar Collector provided with artificial roughness for indirect type solar dryer.

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Abstract: Improving drying agricultural food products in an indirect type solar dryer (ITSD) is a topic of frequent research, This study includes a numerical analysis of enhancing heat transfer and fluid flow behaviours in rectangular duct solar air collector (SAC) by providing artificial roughness on the surface of the absorber plate, the proposed roughness was considered as a rectangular rib placed to the back of the absorber of ITSD, For a fixed value of heat flux 1000 W/m2, the Reynolds number, ribs blockage ratios (BR) and ribs-pitch spacing ratios(PR) are chosen as design variables to examine their effects on the Nusselt number (Nu), the friction factor (f), and the thermohydraulic performance parameter (THPP). A two-dimensional CFD simulation was achieved using the ANSYS Fluent software. The RNG k-ε turbulence model with enhanced wall treatment is selected as the most appropriate one. The simulation results are compared with smooth duct which indicates that the duct with roughened surface enhances the heat transfer and friction factor (fr) by the presence of the transverse ribs yields a significant enhancement of the heat transfer, the present CFD analysis clearly demonstrates that the average Nusselt number and average friction factor rise with increasing ribs blockage ratios while giving an opposite trend with increasing ribs-pitch spacing ratios. The SAC with rectangular rib roughness of BR= 0.2 and PR = 8 provides the highest THPF of about 1.091 at Re of 4000. Attempts were carried out to explain the mechanisms of fluid behavior in the presence of this type of obstacles and their impact on both fields, thermal and dynamic.

Parameter extraction of proton exchange membrane fuel cell models using a new mutated Invasive Weed Optimization

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Abstract: Over the past few years, the extraction of the fuel cell (FC) model parameters has remained an active research area based on experimental data and metaheuristic methods. However, accurately estimating such characteristics is still a difficulty. Hence, a new hybrid algorithm is proposed to extract the PEMFC's parameters named new mutated Invasive Weed Optimization (Mu_IWO). This algorithm is used to identify the 500-W BCS, NedStack PS6, and 250-W stacks model parameters while the estimation is based on the experimental data of the nonlinear I-V characteristic. A comparison study with previously published relevant papers is conducted to assess this novel technique. In terms of the number of function evaluations (NFE), and mean standard deviation (STD), the proposed Mu_IWO outperforms the literature and implemented algorithms. Mu IWO was able to produce results that were competitive in these models. for example in 500-W BCS stack (SSE=0.0116, STD=6.8637e-09, NFE=22763). Finally, the outcomes support the suggested Mu_IWO based parameter estimate of the PEMFC empiric model in terms of its effectiveness, robustness, and reliability for a variety of case studies.

Comparative study between two-level and three-level T-Type voltage source inverters used in photovoltaic systems for grid-tied Applications

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Abstract: In the last decade. Renewable energy sources have known large penetration in supporting the power system due to their main advantages compared to the conventional sources. Especially the photovoltaic sources which have been integrated into the main grid in several countries. solar photovoltaic sources have been integrated into the main grid in several countries. Therefore, much research has focused on the development of improved topologies and control techniques for inverters to ensure the integration of these sources into the main grid. In this context, multilevel inverters have been proposed to overcome the main drawbacks of two-level VSI inverters in different applications. In this paper, the studied topologies of 3-level T-Type inverters and a conventional two-level inverter are used as an interface between the power generation system consisting of a photovoltaic generator system (PVG) and the AC load. The PVG is composed of PV panels and a DC-DC boost converter controlled based on the P&O technique to ensure maximum point extraction and maintain the output DC voltage within the desired limits. The studied topologies, the 3-level T-Type inverter, and the 2-level VSI inverter are being controlled based on the sinusoidal pulse modulation (SPWM) techniques to ensure the desired output voltage meets the required RMS and frequency values. This paper mainly focuses on the analysis of the performance of the two topologies according to the applied control techniques, focusing on the power quality of the output voltage. Losses, and the tracking accuracy of the required output voltage. Finally, the performance evaluation and the simulation results have been presented and analyzed, especially based on the THD of the output voltage and the losses in the inverter.

Study of magnetism in new Heusler alloys based on no-magnetic elements SrZN2 (Z = K, Rb,Na).

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Abstract: Heusler alloys have gained tremendous attention in material science and spintronic applications due to their facile synthesis and exceptional physical properties. In this communication, we elucidate the origin of magnetization in the full heusler alloys srzn2 (z = k, rb, na). The calculations were performed within the framework of the density functional theory by using full potential linearized augmented plane wave method (fp-lapw) (dft).. The exchange– correlation potential is evaluated using the generalized gradient approximation (gga) of perdew–burke–ernzerhof (pbe) and the modified becke and johnson (mbj-gga). Regarding structural properties of srzn2, we found that the l21 phase, ferromagnetic state is more stable. Furthermore, spin-polarized calculations reveal that the heusler alloys srzn2 (z = k, rb,na) exhibit half-metallic ferromagnetism with the integer magnetic moment of 3 μb per formula unit which is in good agreement with the slater–pauling rule based on the relationship of valence electrons. The current comprehensive theoretical study of the magneto-electric properties predicts that these new heusler alloys can be utilized successfully in spintronic devices.

Complexation of l-serine and its derivatives with copper and nickel

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Abstract: The chemistry of heterocyclic complexes of metals has developed enormously in recent years due to the discovery of strong complexing properties manifested by heteroatoms such as oxygen, nitrogen and sulfur. A ligand is an atom, ion or molecule bearing chemical functions allowing it to bind to one or more central atoms or ions. The term ligand is most often used in coordination chemistry and organometallic chemistry. Several studies carried out recently in our laboratory on the one hand the synthesis of heterocycle from an α-amino-β-hydroxy-propanoic acid, on the other hand the study of the capacity of formation of complexes of the acid and their derivatives synthesized with copper (II); nickel (II). The study of the complexation shows that the ligand and its derivatives have a capacity to form complexes with copper (II) and nickel (II). The work that we present is part of a set of research carried out in our laboratory, it is accompanied by the synthesis and the formation of complexes by thin layer chromatography TLC, IR, UV- Visible, NMR.

Comparative Study Between PI and Synergetic Mechanical Speed based MPPT Control in Wind Energy Conversion Systems

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Abstract: Write A wind turbine is a device that transform kinetic energy from the wind into electric energy. Currently, the majority of Wind Energy Conversion Systems (WECS) use Doubly Fed Induction Generator (DFIG), which gives the advantage of better exploiting wind resources in different wind conditions thanks to its variable-speed operation. To maximize the converted power, we talk about the Maximum Power Point Tracking (MPPT) with mechanical speed control that allows permanently to exploit the maximum of wind energy by adapting the speed of the turbine to the wind speed. The speed controller continuously adjusts the generator shaft speed in order to impose the reference electromagnetic torque of the DFIG in the aim to be tracked. The turbine shaft speed is then controlled to obtain a maximum power coefficient Cp and the Tip Speed Ratio (TSR). Several works have addressed the problem of optimizing energy production, using different MPPT techniques. This paper introduces Synergetic Control (SC) method in the WECS in order to give the MPPT. Simulation results under a random wind profile show the effectiveness of the proposed SC comparing to the classical PI controller in term of perfectly tracking the desired reference and reducing the effect of the aerodynamic torque which constitutes a disruptive input. In fact, finding maximum power, for each wind speed, is equivalent to finding the optimum rotational speed that improve the quality of the energy produced and also assure an efficient injection of electrical power into the network.

Assessment of wind power in Laghouat area

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Abstract: Wind energy is one of the clean and promising energies most likely to replace fossil fuels. Algeria has developed an ambitious program to increase the share of renewable energy in the total energy production by 2030, in which wind energy takes second place after photovoltaics. In this study we have evaluated the wind potential of a site in Oued M'Zi in Laghouat area through analyzes of wind speeds and a feasibility study to carry out a wind farm project. The study showed the importance of the wind energy as well as the electrical energy likely to be produced to reinforce the electricity production in Laghouat area

Structural and optical properties of La3+ doped BaTiO3 powders prepared by sol-gel method.

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Abstract: Barium titanate (BaTiO3: BTO) is a semiconductor of perovskite structure [1] with a great material potential mainly due to its wide band gap which is very useful in electronic and optoelectronic applications [2]. These properties can be improved by doping BaTiO3 with rare Earth and especially with lanthanum (La3+). In this work, pure and doped barium titanate (BaTiO3: x La) powders with different concentrations of lanthanum (x= 0, 2, 4, 6, 8, and 10%) were synthesized by sol-gel technique and annealed at 800 °c /2h. The characterization of the structural and optical properties of these samples was performed by X-ray diffraction (XRD), Fourier transform infrared spectroscopy (FTIR) and UV-Visible spectrophotometry. X-ray diffraction and infrared spectroscopy confirmed the formation of BaTiO3, the results showed that all samples crystallized under the cubic structure and allowed the determination of the crystallite size. The band gaps of the samples were determined from the UV-vis absorption and the effect of La3+ doping was discussed in this study.

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Effect of Deposition Time on Optical and Structural properties of Copper Oxide Thin film

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Abstract: From the new developments in several key areas, cuo films appear to be a highly promising new and advanced functional material. our main goal is the production of films with a suitable structural, optical and electrical properties required for solar cells application. in this work, we used pneumatic spray pyrolysis technique to deposit thin films of copper oxide with the variation of deposition time from 1 to 5 min, and the other parameters such as deposition time (3min), substrate temperature (450°c), pressure (1bar) and distance nozzle to substrate (30cm) were kept constant. in order to study the influence of the deposition time on the properties of the films produced, we have used : x-ray diffraction to determine the films structure and uv-vis spectroscopy for optical properties. the experimental results show that : the films are polycrystalline copper oxide with monoclinic structure with orientation (110), (-111), (111), (020), (-311) and (220). films thicknesses estimated by gravimetric method were between 64 – 355 nm. the average size of grains was between 16 and 35 (nm). while the strain values in order of 10-3. the films are absorbent in the uv-vis range. and the band decrease from 2.67 to 2.09 (ev) with the increase of deposition time from 1 to 5 (min).

TiO2-Montmorillonite nanomaterial contribution to degrade colored solution

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Abstract: The textile industry contributes to the pollution of the environment by these discharges (wastewater), where their treatment is a necessity to preserve the environment. Conventional methods have proven their limits since they lead to new potentially dangerous products, on the other hand, new innovative and reliable techniques have emerged in recent years grouped under the name of advanced oxidation processes (AOP); which lead to the total mineralization of pollutants without any sludge production such as photocatalysis and sonocatalysis, with use nanomaterials as catalysts. One of their applications is the elimination of the chosen model dye: Direct Yellow, used in the Algerian industry, by testing the photocatalytic activity of nanomaterial titanium-based Montmorillonite, supported on treated Algerian natural clay. XRD results reveal TiO_2 intercalation with a basal distance of 16.36 Å. The percentage of TiO_2 exceeds 40% (FRX analysis), the BET specific surface is 234 m2.g-1, the pore volume of 269 cm3.g-1, pHpzc = 5.2 and the peak of an exothermic nature (Analysis TG/ATD) located between 940 and 950 °C is due to the destruction and recrystallization of the silicate network. The results of photocatalytic degradation were 60%, sonocatalysis was 50%, compared to those of sonophotocatalysis which were better (97%), thanks to the synergistic effect of the coupling of the two processes (photocatalysis and sonolysis).

Effect of GaAs Layer Position on Electrical Performance of ITO/Si/GaAs/Si/ITO Solar Cell

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Abstract: In the field of new technologies for energy, solar photovoltaic cells in semiconductor technology are becoming an industrially important axis of development. In this paper, the influence of the GaAs layer position on the electrical behavior of the ITO/Si/GaAs/Si/ITO solar cell has been studied at room temperature and under standard illumination conditions (AM1.5G) using SILVACO 2D-Atlas simulation software. To carry out this work, the static characteristics (Current-Voltage I-V and Power-Voltage P-V) and the electrical parameters (the short-circuit current ISC, the open-circuit voltage VOC, the maximum power Pmax and the factor of FF shape) of this cell have been respectively simulated and extracted according to the different positions of the GaAs layer. The simulation results clearly show that the photogenerated current ISC is significantly influenced by the position of the GaAs layer, in which this parameter increases when the GaAs layer approaches the cathode electrode of the cell (ITO/Si/ GaAs/Si/ITO) due to the increased concentration of electron/hole pairs produced in the semiconductor material of this cell. This can also be attributed to the reduced charge recombination effect in this solar cell due to the increased lifetime of these pairs. The fact that the VOC voltage is little affected by the change of position of the GaAs layer is due to the type of the junction (uni-junction) and to the structure (heterostructure) of this solar cell. The maximum current Imax of this solar cell increases considerably with the change of the position of the GaAs layer towards the cathode electrode of this cell; on the other hand, the maximum voltage Vmax remains constant for the different positions of this layer. This leads to a considerable increase in the maximum available power Pmax of our proposed solar cell. This characterization shows that the performance of the ITO/Si/GaAs/Si/ITO solar cell improves when the GaAs layer approaches the cathode of this cell, in particular the solar cell of the ITO/p-Si/Si/GaAs/n-GaAs/ITO structure.

Solar cell with and without window layer by SCAPS-1D software

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Abstract: In this work, we present a numerical simulations results of a copper indium gallium diselinide thin film solar cell using SCAPS-1D device simulator. we study the effect of window layer thickness on the electrical properties of solar cell such as: the fill factor FF, the open circuit voltage Voc, the short circuit current density Jsc and the power conversion efficiency **η**. we study the structure with and without window layer also. This results show without window layer **η**=18.27%, FF=84.36%, jsc=27.08mA/cm2, Voc=0.799V. While **η**=19.99% , FF=84.54%, jsc=29.56 mA/cm2, Voc=0.799V, are obtained After optimization with ZnO as window layer. This results under AM1.5 G spectrum having a constant illumination of 1000W/m2 at 300k.

Key Words: CIGS, SCAPS-1D, window layer, electrical properties, efficiency.

Plectranthus amboinicus leaf extract-assisted biosynthesis of ZnO nanoparticles and their biocidal activity

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Abstract: The field of nanotechnology is attracting the interest of researchers towards the green route of nanoparticle synthesis. In this work, the green synthesis technique was used to induce the synthesis of zinc oxide nanoparticles using plectranthus amboinicus,we report an eco-responsible synthesis of nps using (p.a) leaf extract, which is a simple and ostensibly fast method that produces stable nanoparticles. The extract of the plant (p.a) was found to have excellent reducing and stabilising properties. Using ultraviolet-visible spectroscopy, x-ray diffraction (xrd),. The analysis by uv spectrometer shows the characteristic peak indicating the synthesis of nps.the xrd results showed a particle size of 16.72nm and it reveals a crystallinity of nps. This method proves to be cost effective, can be performed easily.this method proves to be cost effective, can be performed easily. We studied the biocidal effect of zno nps on two bacterial strains (escherichia coli (e. Coli) and klebsiella pneumoniae (kp)) by the agar diffusion technique (well method).

First principles study of oxygen terminated 2D-dimensional tungsten carbide as anode material for lithium ion battery

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Abstract: Recently, 2D-dimensional MXenes materials have gathered considerable attention, since they are promising anode candidates for lithium-ion batteries (LIBs) due to their unique properties such as excellent conductivity, large surface area, and high Li capability. In this work, First-principles calculations were carried out to evaluate the performance of O-terminated W2C MXenes as anode for LIBs. The calculated Phonon spectrum and molecule dynamic simulations show that W2CO2 is dynamically stable upon 300K. The electronic properties analyses show the metallic property of W2CO2, which will have good electronic conduction (this leads to fast electron transport rate in the charge/discharge process). The obtained adsorption energy and energy diffusion barrier of the Li atom on the surface are -3.12 eV and 0.28 eV, respectively. The maximum theoretical specific capacity of W2CO2 monolayer as Li-ion batteries is 260 mAh/g for double side adsorption.

A comparative study of different metals on back contact for CZTS solar cell

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Abstract: Copper Zinc Tin Sulfide Cu2ZnSnS4 (CZTS) is a quaternary semiconductor with non-toxic earth abundant constituent material. In this work, we present a numerical simulations results of CZTS thin films solar cells using the Analysis of Microelectronic and Photonic Structures (AMPS-1D) simulations, The optimization is performed by choosing the optimum value of a work function of metal for a back contact on this structure (Pt,Si,Cu,Au,Ni)/CZTS/CdS/ZnO/Al, We study the effect of work function of back contact on the electrical properties of solar cell such as FF, Voc, Jsc and Eff. PHIBL varied from 0.7-1.4eV. The power conversion efficiency optimize from 20.434% to 30. 978 %. The most results 30.978 % as efficiency, 29.01mA/cm2 as short circuit current density, 1.245V as open circuit voltage and 85.8% as fill factor are obtained with a Platinum (Pt) as a back contact.

Removal of Ibuprofen from water by a new magnetic adsorbent prepared from sawdust

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Abstract: The objective of this work is to prepare an innovative magnetic adsorbent (SBAM) from a conventional adsorbent based on chemically activated sawdust (SBA) and to test the capacity of these two adsorbents for the elimination of ibuprofen (IBP) water. The SBAM adsorbent is prepared by coprecipitation of Fe2+/Fe3+ ferric ions in a basic medium. The study of the adsorption of IBP on these two adsorbents and under different operating conditions (dose of adsorbents, contact time, pH, initial concentration, effect of salts, and temperature) showed that pH is the factor which influences the elimination of IBP the most and that the optimal pH is equal to 2. The kinetic study of the adsorption showed that the elimination of IBP on the two adsorbents is rapid and that the model of the pseudo second order is the most adequate. The experimental results at equilibrium adsorption are best described by the Langmuir model indicating the adsorption of IBP on a homogeneous monolayer of the adsorbent. The chemical and thermal regeneration tests of the two adsorbents are successful and their reuse can reach three cycles.

Bismuth three oxyde Nanopowder electrode for the production of hydrogen by photoelectro-chemical Water splitting

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Abstract: Bismuth three oxide (Bi2O3, semi-conductor) nanoparticles (NPs) were synthesized by chemical method. The obtained Bi2O3 NPs were characterized by several techniques like SEM, UV-Vis and DRX. The SEM observation of nano-powders, shows the formation of particles with nanometrical sizes. UV-Vis spectrum revels a strong bands for Bi3+ ions and we got the peak of Bi0 after the reducing process. The XRD analysis confirmed the formation of 'Bi2O3' by its specific peaks referring to the literature after the thermal treatment. Finally, as an application, we monitored the effect of Bi2O3 NPs used as an electrode in Na2SO4 bath for the photo electro-chemical Water splitting, under UV and Visible irradiation and in the dark for the production of hydrogen.

First principles study of Structural electronic and optical properties of TixZn1-xO alloys with (x = 0, 0.0125, 0.25 and 0.375)

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Abstract: In this study, the structural, and optoelectronic properties of TixZn1-xO alloys with (x = 0, 0.0125, 0.25 and 0.375) are investigated using the first principle method with a full-potential linearized augmented plane wave (FP-LAPW) as implemented in WIEN2k code, which is based on density functional theory (DFT). We used the generalized gradient approximation parameterized of Perdew-Burke and Ernzerhof (PBE-GGA) to calculate the structural properties, while the electronic and optical properties were determined using the Tran–Blahamodified Becke-Johnson (TB-mBJ) potential functional which gives improved band gaps compared to PBE-GGA. The results reveal that by Ti-doping ZnO the band gaps broaden and remain direct at Γ. When substituting Sn-impurities, the Fermi level is displaced into the valence band due to the 3d-Ti orbital producing a p-type semiconductor. The optical response shows low absorption, reflectivity and the blue shifting of the optical transmittance in Ti-doped ZnO due to an increase in of the band gap, according to the Burstein-Moss effect. Our results reveal that Ti-doped ZnO could be useful for transparent conducting applications.

Correction and maintenance of natural gas pipes made of polymers under pressure

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Abstract: The tubes may have defects or micro cracks, due to the manufacturing process, handling accidents, thermal shocks, etc. These faults can develop under the effect of network operating conditions and lead to the formation, over time, of long cracks which will eventually cause the tube to rupture and gas to leak. As this kind of networks is used in urban environments, a gas leak could lead not only to serious consequences, but also to make the replacement of the tube very complicated in terms of time and safety. In general, a PE gas distribution network operates between 1 and 4 bars, after deducting a few supply antennas, for which the service pressure is 8 bars. In order to identify this phenomenon of propagation, we proceeded to the analysis of the evolution of the crack. Our work consists of repairing cracks in HDPE pipes. That essentially consists of knowing and studying different welding techniques on high density polyethylene which transfers gas. In this work we present the different welding techniques of high density polyethylene (HDPE) butt and electro-fusion. Then an experimental study to propose other methods of repairing the problems of gas leaks in HDPE high density polyethylene ducts. The results are acceptable in the event of problems with the welding machines or delays in the intervention of the repair services.

Unsophisticated two-step synthesis of Pristine Tin Sulfides (SnS2) thin film via Spray Coated approach

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Abstract: In the present work, we explored the consequence of solvent evaporation temperature on the SnS2 thin films synthesised for first time from programmable lab-scale spray pyrolysis machine on glass substrate using spray-coating approach. Thiourea (SC(NH2)2) and tin chloride (SnCl2) are the key chemical reagents used for this experiment under atmospheric conditions. The synthezied films was studied through a series of characterisation methods, including by Raman spectroscopy, atomic force microscope (AFM), UV-Vis spectrophotometer, and photoluminescence measurements and X-ray photoelectron spectroscope (XPS). The obtained results show that pristine SnS2 can be successfully formed. Our films are found to be dense and optically low transparent in the 300-1300 nm range with associated band gaps energy ranging from 2 eV to 2.22 eV. The XPS analysis of as-grown SnS2 thin films confirm the films formation and showed them to be stoichiometric

Comparative study between the World Health Organization guideline of permissible copper in drinking water and the detection limit of an electrochemical sensor based on Zn(OH)2

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Abstract: While some heavy metals are essentials for humans such as copper (cu), cobalt (co) and zinc (zn), a continues exposure to these heavy metals at high concentrations can induce severe illnesses that constitute a significant hazard to living organisms. For this reason, various health and environment agencies have established guide values for the permitted exposure and intake of humans to these heavy metals, therefore, it's indispensable to find an effective and sensible method for copper detection in water. Herein, an electrochemical sensor based on carbon graphite modified electrode was developed. Since the cost of the sensor is as important as its sensibility, the choice of the carbon graphite as substrate is based on its low price and availability, other advantage of the proposed sensor is the facile elaboration method, which can be achieved using the chronoamperometry technique in two simple steps, initially, a metallic zinc film was deposed for 210 s (at -1.78 v vs sce), then, the metallic film was oxidized for 360 s (at 0.1 v vs sce) to achieve the finale layer of zn(oh)2. Under optimum conditions the gr/zn/zn(oh)2 sensor showed a wide linear range (1.00 × 10–8 – 6 × 10–7 m) and low detection limit (9.03 × 10–10 m) which is much lower than the world health organization guideline (3.148 × 10–5 m) as the maximum allowable copper concentration in drinking water. Thus, it can be used as a cheap alternative for source water

Analysis of the mechanical behavior of the composite patch repair of a corroded and cracked plate

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Abstract: Bonded composite repairs are a diverse and cost-effective way of repairing, reinforcing, or updating faulty metallic structures. There have already been several effective instances of bonded patch repair of thin metallic plates in aerospace structures, such as fuselage skins damaged by fatigue loads. Our work which is part of the repair of an inclined crack and corrosion, by composite patch in a plate al T3-2024. The numerical simulation based on the three-dimensional finite element method using the ABAQUS calculation code is used to analyse the effect of adhesive types on the variation of the damaged zone and the different composite forms on the variations of the integral J. Finally, the variation of crack inclination affects the ratio of the damaged area DR.

The effect of the angle of inclination on the productivity of solar stills in the southeast of Algeria (El-Oued)

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Abstract: Several governments are presently concentrating on renewable energy. Solar energy is a free and plentiful resource that may be employed in many different applications, most notably solar distillation. Several variables affect how well a solar still performs. The declination angle of the glass cover is one of the considerations. This final factor was the subject of an experiment to demonstrate its impact on the still's output. At the same time and in the same climatic conditions, several sun stills of (0.50 x 0.50 m) were tested at varied angles of 10, 15, 20, 30, and 40°. According to the results, the equivalent results are 2.104, 2.236, 3.252, and 1.908.5 kg/m2. day. Therefore, the optimal angle had a daily output of 3.252 kg/m2 and was at 30°.

Study On the Behavior of the Self-biased Voltage Generated by the Electrical Asymmetry Effect in DF-CCP Discharges

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Abstract: Dual Frequency Capacitively Coupled Plasmas (DF-CCP) are widely used in many industrial surface processing applications. The proposal to submit plasma to a dual frequency has generated an electrical asymmetric effect, and the variation of the phase angle (θ) and the blocking capacitor (CB) gave a means of control over the flux and the bombardment energy. In this work, we propose to study the behavior of the self-biased voltage due to the electrical asymmetry effect. The input voltage is: Where fL= 13.56 MHz and fH = 27.12 MHz , keeping the voltage V0 = 500V. Our results show that the phase angle (θ) and the blocking capacitor (CB) can play a role in the control of self-biased voltage.

Degradation of the mixture of two textile dyes using ZnO immobilized on the glass substrate

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Abstract: Recently, the use of photocatalysis for the treatment of a variety of pollutants such as dyes, is rapidly increasing. Various semiconductors have been utilized for the photocatalytic removal of pollutants, these catalysts can be employed either in a colloidal or in an immobilized form. The prime aim of using the immobilized form is that the costly and extra final filtration process can be avoided and the ability of reusing the catalysts for many cycles. In this work, the Synthesized ZnO NPs are immobilized on a glass substrate using Spray fixation method, Structural characterization by XRD and spectroscopy Raman revealed the ZnO Wurtzite variety. FTIR and EDS spectra ZnO NPs showed no trace of contaminants. The MET and SEM analyzes were performed for morphological evaluation. EPR analyzes and XPS were performed for more information on defects and oxygen gaps in the prepared material. The photocatalytic activity has been evaluated using a loop reactor for the degradation of two textile dyes: namely, Reactive Blue 19 (RB19) and Direct Red 227 (DR227) as well as their binary mixture (RB19+DR227). Under UV-light for 390 min, the concentration of RB19 solution reached 82% of removal yield. The concentration of DR227 solution reached 79 % of removal yield within 390 min. The degradation efficiency of the mixture of the two dyes reached 56% within 390 min.

Dimeric Spin-Crossover of fe(II) Complexes: Mössbauer and x-ray crystallographic study

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Abstract: Research efforts into the spin-crossover phenomenon have reached new heights recently, as industrial applications (memories, optical devices, etc.) seem to be quite near athand [1]. Obviously, the possibility goes through a deeper understanding of the physics involved, and various research groups have focused on increasing this understanding, more specifically on relaxation processes of metastable states and cooperativity effects [2]. Chemists are feeding this effort through the design and synthesis of novel molecules, and on-going efforts are directed towards the synthesis of oligonuclear complexes, [3]A dinuclear iron(II) complex containing the bridging ligand 4,4' bipyridine (bpy) has been synthesised [4] and characterised by single-crystal X-ray diffraction, magnetic susceptibility and Mossbauer spectral methods. Variable temperature magnetic susceptibility, Mossbauer spectroscopic end X-ray crystallographic studies are described on two structurally similar families of dinuclear iron(II) spin crossover (SCO) complexes of formula{[Fe(NCS)2(bpp)]2(bpy)}. Structural analysis at each of the three plateau temperatures has revealed a dinuclear molecules with spin states HS-HS, HS-LS and LS-LS (HS:high spin, LS: low spin). Structural characterisation of this material reveals subtle changes to the coordination geometries at each of the iron(II) centres and striking change to the local environment of the dinuclear complex.

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Computational analysis of the thermal performance of an earth air heat exchanger with a novel sectional pipe shape

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Abstract: The world today is caught in a vicious circle between global warming, which has increased demand for space cooling, and cooling applications that use significant quantities of electricity, thus causing global warming. To get out of this circle, it has become necessary to exploit renewable energy resources to provide the appropriate climatic conditions within the spaces without harming the environment. In this aspect, this paper aims to study the effect of pipe cross-section geometry on outlet temperature to achieve proper cooling of buildings. Two geometric shapes of pipes, round and oval, were studied using CFD modeling under summer climatic conditions of Biskra, Algeria. Based on the results, the oval pipe showed a decrease of 1.6 °C compared to the normal round pipe of 10 m length each, which makes it an available option to improve heat transfer and cooling inside buildings.

Investigation of Applied RF Voltage Amplitudes on a Capacitively Coupled Plasma

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Abstract: This work studies the effect of the ratio (β) of the voltages amplitudes VL and VH of the radio frequency signal applied to a capacitively coupled plasma discharge (DF-CCP): VRF= VLcos(2πfLt+θ)+ VHcos(2πfH t) With fL=13,56 MHz, fH =27,12 MHz ,β=VL/VH ; VL+VH= 500Volts and θ the phase angle. Our simulations are based on the Particles In Cell method taking into account Monte-Carlo collisions (PIC-MCC) and our results are confirmed by a semi-analytical model and showed that the couple of parameters (β, θ) controls independently the potential drop on each electrode almost independently.

Contribution to structural and morphological study of long time electrodeposited Mo layers coated on Cu substrate under current density

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Abstract: In this study, we present a successful Mo electrodeposition for 1800 seconds to reach bright and rough Mo coatings. This investigation was carrying out from aqueous electrolyte precursors solved in acid media. XRD analysis and EDS spectrum have been used to confirm the presence of Mo. The crystal structure of deposits was slightly amorphous in nature to body centred cubic structure (bcc) Mo (110), (211) and (220) face. Lattice parameters exhibit some residual tensile stress, and deviate slowly from reference lattice parameter. In addition, calculated lattice parameters agreed well with few available works from literature. Surface top was observed at different zoom in order to deep inside the origin of Mo coating properties. Discussions on the grain growth prove that they are constrained by grain boundary energy not the thickness effect. Further discussions were devoted to inspire some relationships and correlations in the view of the solar cell application as bottom contact.

Active Filtering In The Presence Of Wind Energy

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Abstract: The increasing use of controlled systems based on power electronics in industry causes more and more problems like deterioration of the power systems voltage and current waveforms in Wind Energy Conversion System (WECS) based on Doubly Fed Induction Generation (DFIG). The circulation of deformed currents causes harmonics and voltages imbalances. Several solutions have been proposed in the literature to clean up the harmonic pollution; among them "The parallel active filter". In this paper and with the aim to improve the power quality, we have studied active power filter. First, we simulated the electrical network with wind generation and its non-linear load without connecting the active filter to see the effect of harmonics on the shape of the absorbed current, then, the active shunt filter was connected in parallel to the network where the wind turbine is located in order to inject the currents allowing the harmonic pollution of the non-linear loads to be eliminated. We have presented three types of active filter current control: control by Pulse Width Modulation (PWM), control by conventional hysteresis and finally by modulated hysteresis. The results obtained with the three control methods show that the implementation of an active filter makes it possible to considerably reduce the harmonic content of the source current. This result is explained as the Total Harmonic Distortion (THD) reduction below 5% after filtering. It has been observed that the THD obtained with the PWM control is lower than that obtained with hysteresis and with modulated hysteresis.

Experimental study of a single slope solar still with difference the glass

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Abstract: In this study present, a new experimental work of the thermal performance of a single – sloped solar still with different glass thickness. The experiments were based on two distillates. The first (4mm), and the second (5mm). The comparison was made and the results were shown that productivity rate first still 3.8L/m² and second still 2L/m².The lower the glass thickness of the cover, Higher the transmittance of solar radiation and the more distilled water yield.

Hydrothermal synthesis of zinc oxide nanoparticles for Photocatalytic Degradation of Methylene Blue under UV irradiation

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Abstract: Nanostructured materials have attracted extensive attention due to their valuable physical and chemical properties and applied extensively in a number of different areas including heterogeneous catalysis [1] . In the present study, Nanocrystalline Zinc oxide was synthesized by simple hydrothermal processand. using zinc acetate di-hydrate [Zn (CH3COOH)2 2H2O 9] and acide oxalic In order to adjust the pH . three samples were synthesized by varying the pH value of the solution (2,3 and 4) at temperature 150°C for 8 h and The calcination was carried out at 450°C for 1 h to obtain ZnO powders.The particles of Zinc oxide were used for degradation of Methylene Blue (MB) dye.The samples were characterized by , TGA/DTA and DRX. DSC/TGA analysis of ZnO sample (before anneal) revealed two endothermic peaks around 134.36 °C and 396.86 °C .The loss of volatile surfactant and the transformation of zinc hydroxide to zinc oxide nanoparticles are responsible for these endothermic peaks[2].XRD results show that ZnO structures are polycrystalline hexagonal wurtzite with high crystal quality.The maximum crystallite size (19,67 nm) of the ZnO powder was obtained at pH 2. The particles sizes of the ZnO synthesized between pH 3 and 4 were in the range of 24,576–23,47nm. The kinetics of photocatalytic degradation of MO obtained by Langmuir- Hinshelwood model show a variation of Kapp was recorded when varying the pH valus 0,03914min-1 , 0,06186min-1 and 0,06664min-1 at pH= 2 ,pH= 3 and pH=4 respectively.

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Integration frequency effect in Preisach model associated with the Student distribution function using the finite element method

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Abstract: Magnetic materials with useful physical and technological properties are exploited in many technical applications, aerospace, medical devices, data storage and in power electronics devices. However, these devices can operate at different frequencies, which affects their magnetic behaviour, therefore a frequency-dependent hysteresis model is needed to more accurately model of hysteresis for these materials. This work is devoted to the integration of the Preisach model associated with the Student distribution function using the finite element method in 2D. The simulations carried out with the calculation code allowed us to study the impact of the hysteresis phenomenon on the magnetic quantities and the evolution of the losses as a function of the frequency. As an application, we studied the classical model of an induction device. The simulations carried out with the calculation code allowed us to study the impact of the hysteresis phenomenon on the magnetic quantities and the evolution of the losses, thus validating the reliability of the model and the resolution method.

Study of the influence of materials used for dental implants by three-dimensional finite element analysis

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Abstract: A dental implant is an artificial root of biocompatible material, which is surgically placed into the alveolar bone for supporting a prosthetic dental crown in order to replace missing teeth. The choice of the material is a crucial factor for its good osseointegration in the jaw and therefore implant success. The aim of this work is to study the influence of the material of a dental implant by a three-dimensional finite element analysis. In this context, a dental implant of the second premolar in the lower jaw was chosen, with different materials, the implant and its components were modeled using the software (CAD/CAM) Solid works 19. The biomaterials chosen, are titanium alloy, stainless steel 316 and zirconia. The FEM model was simulated using the finite element method using Ansys Worbench 19.2 to find the material giving the optimal solution to obtain a good osseointegration to guarantee implant success by minimizing stress. For each study case, the Von-Mises stresses, shear stresses, and normal compressive stresses are generated by the applied occlusal forces. It was found that the smallest stress is found for the titanium implant then for the stainless steel 316 implant and finally for the zirconia implant, so the results that give the optimal solution are those of the titanium alloy then those of the stainless steel then those of zirconia.

Design Of The Automatic Structure Of Actuators, Process And Sensors Faults To Diagnose Photovoltaic Installation

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Abstract: Solar power is one of the most important renewable energy sources to replace the use of fossil fuels and to generate electric power. Like other systems, it is prone to several faults and anomalies during its operation which lead to lower performance of the system and above all it increases productivity. In this work, we are particularly interested in the development of the complete architecture to diagnose the different faults encountered in a Photovoltaic (PV) system. For this, we have listed, grouped and codified the various defects in a structure to be generated automatically in the Matlab/Simulink environment. We have covered the generation and evaluation of residuals and then the classification of different types of faults, and we have provided some examples of each type such as battery state of charge (storage), convention, partial and total shading on the panel. This structure contains actuators, process and sensors faults. To achieve this aim, we have designed the global automatic structure faults that are appeared in PV installation. Finally, we presented all the simulation results of the faults that we diagnosed and then we developed an automated fault diagnosis structure appearing throughout the photovoltaic installation.

Effect of H2-plasma treatment on the spin-coated perovskite solar cells

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Abstract: In this research, CH3NH3PbI3 perovskite thin films were grown using spin-coating technique. We investigated the effect of hydrogen plasma cleaning on the CH3NH3PbI3 perovskite thin films grown on titanium dioxide (TiO2) deposited on fluorine doped tin oxide (FTO)/glass (SiO2) substrates. The plasma treatment significantly reduced organic residues and contamination on the FTO surface. In addition, TiO2 blocking layer was significantly impacted by cleaning process. We used X-ray diffraction analysis (XRD) to determine the crystallographic structures, where results showed difference between perovskite thin films deposited on substrate cleaned using standard method (chemical solutions-based cleaning process) and those deposited on hydrogen plasma cleaned substrate (Figure 1). The effect of H2-plasma cleaning on perovskite thin films was due to the surface modification of TiO2/ FTO/Glass substrate. In conclusion, the results obtained in our research indicate that the deposition technique presented and the H2-plasma cleaning process highly improve the quality of the heterostructures and consequently the optoelectronic performances of perovskite solar cells.

Structural, electronic and optical properties of AuBY2 (Y= Te, S, Se) semiconductors : First-principles study

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Abstract: The ground state, the structural, electronic and optical, properties of the chalcopyrite semicondctors AuBY2 (Y= Te, S, Se) in the tetragonal phase have been studied using the full potential linearized augmented plane wave (FP-LAPW) method. The exchange-correlation part of the potential is treated within the Wuand Cohen generalized gradient approximation (WC-GGA) applied for structural properties. Moreover, Tran and Blaha modified Becke-Johnson (TB-mBJ) scheme is also applied for electronic and optical properties. From this study, Our the calculated the lattice constants and the bulk moduli are quite consistent with the experimental data and previous theoretical works. Also, it is found that these compounds are possess direct band gaps and their obtained values are in good agreement with reported results. In addition, the optical properties, real part of the dielectric function, the refractive index, the reflectivity and the optical absorption coefficients are calculated from the imaginary part of the dielectric function and are found to be compatible with the previous published experimental and theoretical results. The absorption capability in the ultraviolet and a part of the visible range of these compounds revealed the potential utilization of these materials in photovoltaic applications.

A Complete Methodology for Sizing Stand-Alone Photovoltaic/Wind Energy System with Storage in Algeria's Isolated Communities: An Optimized Techno-Economic Analysis

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Abstract: Our study is based on the mathematical modelling of the various components of a photovoltaic/wind hybrid system (PVWHS). After having developed our own methodology to retrieve, generate, and process the necessary meteorological data from 24 regions extended all over Algeria over a period of approximately 20 years. We took a particular interest in the analysis of the time and energy complementarities between the two renewable energy sources. Thus, among the most isolated areas of the chosen country, «Tindouf» and «El Golea» were selected. In addition to the judicious choice of the organization and the arrangement of the load demand profile, the parameter optimization of the various components of the hybrid system allowed us to reach during our tests a minimum value of the electricity cost produced and consumed. Indeed, it was ~ 0.16 $ kWh in Tindouf and ~ 0.18 $ kWh in El Golea. Furthermore, our results showed that the photovoltaic side is predominant at the level of the PVWHS, which is in agreement with the immense solar potential available to Algeria, particularly in the south of this country.

DFT- Simulation based on different properties of gold clusters Aun+1 (n = 1-3)

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Abstract: Noble metal nanoparticles are attracting a lot of research attention because of their specific properties and their prospects for use in different fields of application such as, photonics, health, energy, etc [1-5]. In practice, these properties is investigated experimentally or theoretically by using different computational approaches in quantum mechanics and solid state physics, like ab-initio calculation with the density functional theory. In this work, we have systematically investigated the equilibrium geometry, electronic and magnetic properties of Aun+1 clusters (n = 1–3) using the fundamentals density functional theory by generalized gradient approximation (GGA) implemented in the SIESTA simulation package [6]. The relative stability in terms of binding energies, HOMO-LUMO gaps, vertical ionization potentials and electronic affinities for all pure structures were studied. The obtained results show that the binding energies generally increase with increasing cluster size indicating that the clusters continue to gain energy during the growth process. The evolution of the electronic structure can also be examined by calculating the characteristics of the energy gap between the high occupied molecular orbital (HOMO) and the lowest unoccupied molecular orbital (LUMO).

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Lignocellulosic fibers from cladodes of opuntia ficus indica reinforced polylactic acid biocomposites

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Abstract: With increasing environmental awareness and ecological risk, biocomposites have gained more and more research attention, as they have the potential to be attractive than the traditional petroleum-based composites, which often pose considerable problems with respect to their reuse or recycling at the end of their usable lifetime, mainly because of the nonbiodegradable fibers and matrixes[1]. This led to the development of green composites of natural fibers and biopolymers. A new public awareness toward green composites has taken place because of a variety of reasons including major oil crises due to the finite nature of fossil resources, increase in the release of toxic gases into the atmosphere as a result of burning fossil resources and a huge increase in the volume of composite waste [2]. Among the available biopolymer, PLA (polylactide) is the only natural resource polymer produced at a large scale of over 140,000 tonnes per year. Natural fibre reinforced PLA based biocomposites are widely investigated by the polymer scientists in the last decade to compete with non renewable petroleum based products. The type of fibre used plays an important role in fibre/matrix adhesion and thereby affects the mechanical performance of the biocomposites [3]. This work focuses on the further modification of alkaline pre-treated Opuntia ficus indica fibers (OFIF) by using Trimethoxy-octadecyl-silanes (TMOS) and evaluates the effect of silanization on the interaction and adhesion between OFIF and PLA as well as the characteristics of resulting biocomposites. By using Fourier transform infrared, thermogravimetry and mechanical property analysis, the contribution of TMOS modification to the enhancement on the interfacial interaction and adhesion between fibers and PLA proved clearly. The results showed that impact strength and Young's modulus of silanized OFIF biocomposites increased in comparison to those of untreated fiber biocomposites. Similarly, thermal stability, resistance to water absorption obtained biocomposites were improved

Green synthesis and magnetic properties of NiO nanparticles using Nigella Sativa seeds extract

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Abstract: Nanotechnology has gained tremendous momentum in this fast evolving technological age by generating a plethora of scientific concepts to compete with the everyday difficulties of rising technology. Nanomaterials have piqued the attention of several scientific and technical researchers due to their numerous uses and unique features. In the present work we are reporting the synthesis of NiO nanoparticles using extract of Nigella Sativa seeds. The production of the nanoparticles has been carried out at a variety of different pH values. FTIR, XRD, and SEM were among the several analytical methods that were used in order to explore the physico-chemical and structural features of these nano-objects. A special attention is paid on the study of the magnetic properties of the nanoparticles produced using VSM analysis

Green synthesized NiO nanoparticles for non-enzymatic glucose sensing

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Abstract: Glucose is an important biomolecule for human body; it is extensively used in food and beverages industry. Recently, glucose sensors have attracted research attention due to their numerous applications, such as medical diagnosis, bioprocess and environment monitoring. The development of accurate, reliable and low cost devices for glucose determination presents one of the important topics in scientific research. In this work, NiO nanoparticles with 20 nm sizes were successfully obtained by a simple green synthesis route using nigella sativa seeds extract and were further used as a modifier on glassy carbon electrode for glucose sensing. They showed good stability, excellent catalytic ability and remarkable sensitivity.

The effect of Holes transport layer thickness on solar cell performance based on CH3NH3PbI3

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Abstract: The perovskite solar cell is a technologies compelling on account of extremely low-cost, ease of fabrication, and high device performance. This type of the solar cells has the optical and electrical property to absorb not only the visible light spectrum but also the near-infrared as well. In this study, we have used a simulation program called Solar cell capacitance simulator one dimensional SCAPS-1D. The model of the perovskite solar cell introduces the actual parameters values available from industrial data for the process of commercial cells for analyzes the effect of the thicknesses on the performance of the solar cell. We studied the effect of perovskite adsorption layer thickness using different structure Au/HTL /CH3NH3PbI3/ETL/SnO2/glass, where we present the effect of the holes transport layer (HTL) (PEDOT: PSS and Spiro-OMeTAD) on the cell performance. The highest performance reached 26.60%.

Study of the Low Frequency Influence on the Plasma Discharge

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Abstract: In this work, we have studied, the behaviors of a capacitive coupled plasma discharge subjected to an RF signal composed of two frequencies associated with a voltage of 250 Volts applied on the powered electrode, by using PIC-MCC model: VRF=V0/2[cos(2πnfl t+Θ) + cos(2πfh t)], with fh=54.24Mhz, fl = 13.56Mhz, n=1, 2 or 3. The argon gas is under to a pressure of 20 mtorr. In our simulations, the low frequency varies according to the following values; 13.56 MHz, 27.12 MHz and 40.68 MHz. While the high frequency is maintained at 54.24 MHz. The geometry of the DF-CCP reactor is slightly asymmetrical (Ap<Ag). According to several studies, the high frequency source fh is supposed to maintain the plasma and control the flow of ions reaching the surface of the electrodes, when the lower frequency fl source, controls the width of the sheath, the potential of the plasma and ion bombardment energy. It can be seen that the self-bias potential, inducing by electrical asymmetry, depends on the choice of frequencies applied to the discharge.

Light emitting diode based on the material InGaN

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Abstract: Semiconductor alloys are materials that give the possibility to modulate the amplitude of the gap and other physical parameters of the material in order to optimize and expand their microelectronic and optoelectronic applications. Current technology is very interested in this family of material, which is why alloy theory has become an important research topic [1]. Currently the light-emitting diode is an increasingly important component which is used in different fields such as lighting, TV screens, computer screens and decoration. They can replace light sources conventional. They are considered as type of lighting in the solid state, they have exceeded most traditional lighting technologies, also called cold lighting, because the radiation of light does not usually accompanied by a release of heat. They are used in many applications benefiting from a beautiful multi-color [2]. In the present work, we studied and simulated a single quantum well light emitting diode based on the material InGaN using the SILVACO-ATLAS software. This simulation allowed us to derive the characteristics of the LED, and to determine the influence of temperature on the radiative recombination rates, current-voltage characteristic (I-V), optical power-current characteristic (P-I), spectral power, internal and external quantum efficiency. We have found that each time the temperature increases the radiative recombination rate, electrical current and width of the spectra increases and each time the temperature increases the light power and the efficiency decreases [1].

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First principle study of Ba0.75V0.25Se

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Abstract: The investigated structural, electronic and magnetic properties of the Ba0.75V0.25Se alloy are investigated using the Full-Potential Linearized Augmented Plane Wave (FP-LAPW) method within the framework of Density Functional Theory. The exchange and correlation energy is defined throughout this approach by the generalized gradient approximation (GGA-PBE) of Perdew-Burke-Ernzerhof, the same approach is employed to process and improve the electronic and magnetic properties of this compound. The structural properties show the stability of the Ba0.75V0.25Se alloy in the ferromagnetic phase. The electronic results reveal that the Ba0.75V0.25Se alloy has a perfect half-metallic nature.

Keywords: FP-LAPW, GGA-PBE, Half-metallic.

Green synthesis of a 3D flower-like copper oxide nanostructure using a coordination complex: Toward enhancing the photo-degradation of hazardous dye crystal violet

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Abstract: In recent years, photocatalytic technology has shown great potential as a low-cost, environmentally-friendly, and sustainable technology for waste water treatment. Various CuO nanomaterials of different sizes and shapes have been previously evaluated for their photocatalytic activity and these include needles, rods, wires, sheets, particles and flower-like nanostructures. So far, it has been reported that the nano-flower shape provides a larger surface contact area between CuO flower like and neighboring molecules in comparison to conventional particles, which can expose more photo-active sites and enhance the photocatalytic performance. Alternatively, there has been an increasing interest in the use of copper-carboxylate complexes to prepare copper oxide nanostructures by thermal decomposition. However, the major challenge with this method is the accurate control of specific uniform morphologie for CuO. In this context, we successfully prepared a 3D nano-flower like copper oxide via thermal decomposition of a copper-carboxylate complex, initially synthesized in aqueous solution. The nanomaterial prepared in green conditions, was then tested as photocatalyst for the degradation of hazardous dye crystal violet. The phase structure, thermal decomposition route and morphological property were investigated by PXRD, TG-ATD and SEM analysis, respectively. The photocatalytic tests were carried out in the visible light and the remaining concentration of crystal violet was determined using UV-Visible spectrophotometer. The results showed a fast degradation of the dye, indicating the high efficiency of the prepared CuO nano-flower shaped photocatalyst.

Characterization of hybrid biosiliceous iron modified Diatomite modified with titanium dioxide as a catalyst in photocatalysis used UV lamp

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Abstract: In this study, a composite made of titanium-modified ferric diatomite was characterized. Iron (III) nitrate nanohydrate Fe(NO3)3.9H2O and titanium dioxide TiO2 degussa P25 deposition on raw diatomite were used to modify the surface of the titanium-modified ferric diatomite, or "TDF." By using x-ray fluorescence (XRF), scanning electron microscopy (SEM), thermogravimetric analysis (TGA), differential scanning calorimetry (DSC), and UV-visible diffuse reflectance spectroscopy in the Fe(NO3)3.9H2O treatment, surface silica of diatomite and TiO2 degussa P25 were partially dissolved in the iron (III) nitrate nanohydrate Fe(NO3)3.9H2O. TDF has a surface area of 855 m2/g. For titanium produced ferric diatomite modified "TDF" the surface modification a gap band of Eg= 1.1 eV by UV-visible DRS technique.

The structural, electronic and optical properties of Ba2EuMoO6

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Abstract: The combination of stability and energy efficiency has been elusive despite long years of effort by scientists the world over [1]. For this perovskites material have drawn significant attention in solar industry because they milk more electricity out of sunlight than do the conventional crystalline silicon photovoltaic cells[2,3]. Here, We investigate the structural, electronic, and optical properties of the double Perovskite Ba2EuMoO6 using first-principles calculations based on density functional theory (DFT), as well as the many-body perturbation theory calculations[4,5]. The results from this report were consistent with the experimental data. The optical bandgap was accurately estimated from the absorption spectra, and obtained by solving the Bethe and Salpeter equation[6]. Metallic nature is shown in the spin up state, while spin down state shows a direct gap of 2.17 eV. the compound is ferromagnetic and half metallic in nature as deduced from spin polarized calculations. In addition, These results have shown that properties suchas the structural stability, size of the and nature of the bandgap, dielectric function, energy loss, and absorption coefficient of a material are the important parameters which are used to predict a given material as good solar cell absorber.

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Adaptive control of hydroelectric power system

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Abstract: Converting the energy of flowing water into electrical energy produces 20% of all the electrical energy in the world. then the study of Hydroelectric power system is necessary, This paper deals with the control of the Hydroelectric power system, firstly the whole system is modeled then the PID controller is used to control the turbine power, then adaptive control finally a comparative study between the two modes of control is done.

Energy management system for a microgrid based on renewable energy

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Abstract: Due to pollution and the greenhouse effect the use of renewable energy is increasing, this paper deals with the combination of several non-polluting energy sources such as PV, Wind, and Fuel Cells, to generate the maximum power from different renewable energy the ANFIS-based MPPT controller has been designed, under the various environmental condition, vector control technique is used for controlling the DFIG trained by the wind turbine to produces energy MatLab Simulink environmental is used to analyze the system.

Structural and optical characterizations of Cu (In, Al) Se2 films growth by electrodeposition

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Abstract: One of the main challenges of photovoltaic research is the development of devices with lower cost and higher conversion efficiency. This goal can be achieved by using thin film solar cells. The quaternary Cu(In,Al)Se2 under its chalcopyrite structure is one of the most promising absorber materials for photovoltaic applications.In this work, two films of Cu(In, Al)Se2 were deposited on tin-doped indium oxide (ITO) substrates by the electrodeposition method.. We have studied the effect of the aluminum and indium molar ratio ($x = [Al] / [In]$) in the starting solutions on the structural and optical properties of films using X-ray diffraction and UV-visible spectrophotometry. The properties of the obtained Cu(In, Al) Se2 films are suitable for the manufacture of the absorber layer of the solar cell.

Radiative transfer calculation of Ar-Cu thermal plasmas

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Abstract: In the simulation of electrical arc, the representation of radiative contribution is essential to provide a satisfactory description of the thermal behavior of the plasma. The treatment of radiative transfer appears to be complicated due to its dependence on frequency and temperature, and also on direction and position. To overcome these difficulties, we simplify the problem by using the net emission coefficient method (NEC): we assume that the plasma is homogeneous and isothermal, i.e., the properties of the plasma are the same at each point. This hypothesis is especially verified in the core of the plasma, where the temperature gradients are the lowest and the emissivity the highest [1]. On the other hand, the NEC is unable to assess the absorption in the cold regions of the plasma or to estimate the radiative flux. Under these conditions, a simplification of the spectral description is necessary to carry out the calculation of the radiative fields, this relies on an accurate spectral definition which has to consider atomic lines, and atomic continua mechanisms. The simplest approximation consists in considering that the total spectrum can be divided into a limited number of intervals in each, the plasma behaves like a gray body [2], which leads to the definition of mean absorption coefficient (MAC). The results show the respective contributions of the spectral slices in the total radiation of the plasma, which makes it possible to better understand the phenomenon in each region of the plasma.

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Optical and electrical properties of Bi doped CuCo2O4 thin films

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Abstract: Thin layers of undoped and Bi-doped CuCo2O4 (3 and 6%) were prepared using the sol-gel based dip-coating technique. Optical and electrical properties of deposited materials were characterized by UV-Vis and pico-ammeter spectroscopy(I-V). Analysis of optical transmission spectra as a function of wavelength shows high transmittance in the visible light range (T 75%~ 85% for undoped sample and Bi-doped CuCo2O4. Bi-doped CuCo2O4 at different doping rates shows an increase in the bandgap. The lower bandgap energy increased from 1.28 eV for pure CuCo2O4 to 1.48 eV for Bi-doped 6% CuCo2O4. This may be due to lattice distortions caused by the introduction of zinc ions into the CuCo2O4 matrix and the formation of impurity energy levels (acceptor levels) in the bandgap. The results obtained show a regular increase in the electrical conductivity of CuCo2O4 films as a function of Bi doping. From the value of 1.3x103 for undoped CuCo2O4 to1.86x10-2 for 6% Bi doping.

Bi-objective approach for optimal allocation of photovoltaic power system and DSTATCOM in distribution networks based modified salp swarm algorithm

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Abstract: This paper proposes an optimal placement and sizing of photovoltaic (PV) power system and Distribution Static Compensator (DSTATCOM) based Perturbation Weight Salp Swarm Algorithm (PWSSA), as a recent and efficient optimization algorithm to solve the combined optimal allocation. Several objective functions are achieved: minimizing the power loss and the voltage deviation index (VDI). The essential components of distribution power system have been modeled. IEEE 33 BUS have been considered for power flow (PF) analyses, where Newton's Raphson method have been developed to solve PF issue. The simulation results, have shown the effectiveness and validity of proposed method to solve optimal allocation and sizing problem.

The High Frequency Influence in a Dual Frequency Signal Applied to Plasma Discharge

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Abstract: This work shows the effect of the characteristic electrical asymmetry (EAE) on the dual frequency capacitively coupled plasma discharge (DF-CCP). This study is carried out by the particles in cell model taking into account Monte-Carlo collisions (PIC-MCC). The plasma is generated from a pure argon gas at a pressure of 20 mTorr, between two non-identical parallel electrodes. The left electrode is supplied by the fundamental frequency fL=13.56 MHz while the right electrode is supplied by the frequency "n. fL ", where n varies from 2 to 5: VRF = VL cos (2πfLt) + VH cos (2πnfLt+θ) We observe in our simulation results that the influence of the frequencies on the discharge depends on the choice of the couple frequencies. If his harmonic is odd, the electrical asymmetry is significant else if the harmonic is even, then we can see only the electrical asymmetry from the geometry reactor.

Key Words: Plasma discharges, particles in cell, electrical asymmetric effect.

Synthesis, characterization of a new material and application in heterogeneous catalysis

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Abstract: Oxidation by Fenton reactions is a proven and economically feasible process for the destruction of a variety of hazardous pollutants in wastewater. A family of minerals, the tribasic copper chlorides (Cu2(OH)3Cl) have received more attention due to their rich crystal morphologies and their rich applications especially in catalysis. The objective of this work is to carry out the substitution of a transition metal cation in the Cu2+ position in the Cu2(OH)3Cl network to improve its catalytic properties in order to use it as a highly efficient Fenton catalyst. The doped Cu2(OH)3Cl material was prepared by simple co-precipitation under mild conditions and using environmentally friendly raw materials. Then, it was characterized using different techniques; X-ray powder diffraction (XRD), Fourier transform infrared spectroscopy (FT–IR) and thermogravimetric analysis (TGA). An azo dye was selected to study the effectiveness of this material. The experimental results indicate that the catalyst with a Cu2+/M3+ molar ratio = 2 demonstrates a better removal efficiency of this dye.

Rashba Spin-Orbit Effect in [100] Grown GaAs/AlGaAs Double Quantum Wells

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Abstract: Several governments are presently concentrating on renewable energy. Solar energy is a free and plentiful resource that may be employed in many different applications, most notably solar distillation. Several variables affect how well a solar still performs. The declination angle of the glass cover is one of the considerations. This final factor was the subject of an experiment to demonstrate its impact on the still's output. At the same time and in the same climatic conditions, several sun stills of (0.50 x 0.50 m) were tested at varied angles of 10, 15, 20, 30 and 40°. According to the results, the equivalent results are 2.104, 2.236, 3.252, and 1.908 5 kg/m2. day. Therefore, the optimal angle had a daily output of 3.252 kg/m2 and was at 30°.

Photocatalytic process for removal of pollutant from aqueous solutions

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Abstract: Heterogeneous photocatalysis is a rapidly developing process in environmental engineering. This pollution control technique leaves laboratories and enters several sectors of industrial activity, including water purification systems. The main advantages of this method are: low cost, ease of initiating and stopping the reaction, low energy consumption, variety of degradable pollutants and high efficiency of pollutant degradation. On the other hand, its application is still limited to flow rates and low concentrations of effluents. Its principle is based on the use of a semiconductor which, activated by photons of sufficient energy, degrades the chemical molecules adsorbed on its surface. In this work, the objective is to experimentally realize a photocatalytic reactor for use in the field of wastewater treatment processes. The results of our experiments show that the adsorption of the pollutant (10-4mol/l) on the TiO2 in the absence of UV radiation is negligible. Compared to direct UV photolysis (365 nm), the deconcentration of the pollutant is much faster in the presence of TiO2/UV for the same experimental conditions. The study of factors such as the initial concentration of the pollutant, the addition of O2, indicates that their influence is positive on the photocatalytic process of the degradation of the pollutant.

Optimization of the Target Material Choice for High Quality Laser Protontherapy Dosimetry Deposition

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Abstract: A semi-analytical model consisting of three phases of laser matter interaction, plasma creation, electron beam transport into target solid, and proton beam acceleration including different physics phenomena, is established to optimize the protontherapy from laser-matter interaction to tumor-dose delivery. This work was carried out in two stages; Firstly, a Matlab code was developed to characterize the beam of protons coming from the rear face of the target via the TNSA (Target Normal Sheath Acceleration) mechanism, by seeking the energy, the number and the beam spot size of the accelerated protons. Secondly, the outputs of this first modeling stage are included as inputs in a second Monte-Carlo simulation stage of proton-induced interactions in living matter, using the open-source Gate code. Our aim is to get a proton beam with good characteristics in terms of energy and their number "quasi mono-energetic", in order to ensure a good dose distribution in depth within the human body, in other terms: the optimization of the dose depending on the TNSA parameters. The numerical simulation of the energetic electrons effect, their divergence in the solid target and the target material choice on the quality of proton beams were also analyzed. The research of a Spread Out Bragg Peak (SOBP) that can scan human tumors of a certain width were realized, basing on MC-Gate simulation of the proton beam interaction with a water phantom. In addition, the same study is performed for different target materials, Al, Ti, Cu, Ni, Ar and Ta. The numerical results show that the proton front energy-spectrum and dosimetry profiles are significantly affected by the energetic electron proportion and target material. It is found that proton energy profiles and dosimetry behaviors, present a good trend for the

Substituent effects on the structural, optical and electronic properties of naphthalene derivatives: A DFT study

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Abstract: In order to investigate the effect of the substituents CH3, CO2, CO2CH3, COOH, and NH2 on structural, optical and electronic properties of naphthalene derivatives, an important number of physical parameters were calculated using density functional theory (DFT) calculations, with the B3LYP and B3LYP-D3 methods, and 6-31G (d, p) basis sets. This work demonstrates that the structural properties can be affected by the nature and also the position of substituents (α and β positions). The noticeable sensitivity for the molecular geometries was observed in the band angles and bond length for all naphthalene derivatives. Starting from the optimized structures the energy gaps were predicted, the most important effect was observed for Naphthoate, with 3.49/3.19 eV for α and β positions, respectively. For all molecules, other interesting parameters like binding energy and hardness for both α and β positions were estimated. The obtained results confirm the impact of CO2 on these properties. Also, the highest and the lowest value of Electron Affinity and Electronegativity consecutively, were calculated for the same substituent (CO2) in both α and β positions, however, the ionization potential had no significant change. Finally, the UV-Vis, IR, and RAMAN spectra of naphthalene and its derivatives have been simulated and interpreted providing an important information about the influence of the substituents on the vibrational properties of the investigated molecules.

Substituent effects on the structural, optical and electronic properties of naphthalene derivatives: A DFT study

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Abstract: In order to investigate the effect of the substituents CH3, CO2, CO2CH3, COOH, and NH2 on structural, optical and electronic properties of naphthalene derivatives, an important number of physical parameters were calculated using density functional theory (DFT) calculations, with the B3LYP and B3LYP-D3 methods, and 6-31G (d, p) basis sets. This work demonstrates that the structural properties can be affected by the nature and also the position of substituents (α and β positions). The noticeable sensitivity for the molecular geometries was observed in the band angles and bond length for all naphthalene derivatives. Starting from the optimized structures the energy gaps were predicted, the most important effect was observed for Naphthoate, with 3.49/3.19 eV for α and β positions, respectively. For all molecules, other interesting parameters like binding energy and hardness for both α and β positions were estimated. The obtained results confirm the impact of CO2 on these properties. Also, the highest and the lowest value of Electron Affinity and Electronegativity consecutively, were calculated for the same substituent (CO2) in both α and β positions, however, the ionization potential had no significant change. Finally, the UV-Vis, IR, and RAMAN spectra of naphthalene and its derivatives have been simulated and interpreted providing an important information about the influence of the substituents on the vibrational properties of the investigated molecules.

Structural, electronic and optical properties of AuBY2 (Y= Te, S, Se) semiconductors : First-principles study

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Abstract: The ground state, the structural, electronic and optical, properties of the chalcopyrite semicondctors AuBY2 (Y= Te, S, Se) in the tetragonal phase have been studied using the full potential linearized augmented plane wave (FP-LAPW) method. The exchange-correlation part of the potential is treated within the Wuand Cohen generalized gradient approximation (WC-GGA) applied for structural properties. Moreover, Tran and Blaha modified Becke-Johnson (TB-mBJ) scheme is also applied for electronic and optical properties. From this study, Our the calculated the lattice constants and the bulk moduli are quite consistent with the experimental data and previous theoretical works. Also, it is found that these compounds are possess direct band gaps and their obtained values are in good agreement with reported results. In addition, the optical properties, real part of the dielectric function, the refractive index, the reflectivity and the optical absorption coefficients are calculated from the imaginary part of the dielectric function and are found to be compatible with the previous published experimental and theoretical results. The absorption capability in the ultraviolet and a part of the visible range of these compounds revealed the potential utilization of these materials in photovoltaic applications.

Improvement of the photocatalytic degradation of methylene blue using ZnO thin films by Cu doping and additional coupling with Cu2O

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Abstract: Metal oxide semiconductors have shown significant promise for a variety of practical applications. In particular, zno and cu2o have attracted the attention of researchers in various fields, as they are abundant and cheap to manufacture, meet the requirements of clean renewable energy and cost-efficient fabrication, and exhibit good optoelectronic properties. Recently, cu2o and zno have attracted interest in the development of new technologies for wastewater treatment. Most studies refer to the use of cu2o and zno photocatalysts as powder in the photocatalytic degradation of organic pollutants. However, the use of thin-film rather than powdered photocatalysts is a convenient way to avoid the extra procedures related to the separation and recovery processes from the reaction mixture. This study therefore focuses on the removal of methylene blue (mb) dye by heterogeneous photocatalysis with the aim of extending the lifetime of the photogenerated electron-hole pairs of the semiconductor zno by cu doping under uv light and coupling with cu2o under natural sun light. Thin films were prepared by the electrochemical method and characterized by scanning electron microscope (sem), x-ray diffraction (xrd) and uv-vis spectroscopy. The results showed that cu doping increases the lifetime of the photogenerated electron-hole pairs of zno. The combination of cu-doped zno and cu2o allows the construction of a p-n heterojunction that enhances the photocatalytic process of dye under sunlight irradiation.

Magnetic and Photophysical properties of nd4f and 4f4f' Heterobimetallic Complexes Involving Tetrathiafulvalene–Based Ligand.

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Abstract: Lanthanides are the most used metal ions in the design of Single-Molecule Magnets (SMMs) since few years [1] because they present slow magnetic relaxation, high magnetic moment and strong magnetic anisotropy.[2] For both research fields, a challenge is to understand how new physical properties emerge in materials and to combine a multi properties. In this work, two kinds of heterobimetallic complexes with multichelating ligand will be presented. The first one, heteroleptic 3d-4f dinuclear complexes of formula [MLn(hfac)5(L)]n□ (M(II) = Cd, Zn, Co, Mn, Ni and Ln(III) = Dy, Yb, Nd) . Their X-ray structures reveal that the two coordination sites are occupied by one Ln (III) ion and one M (II) transition metal respectively. The M (II) ions are coordinated to the benzoimidazolylpyridine (bzip) moiety in a N2O4 coordination sphere, while the Ln (III) ions are coordinated to the 2, 6-di (pyrazol-1-yl)-4- pyridine (dpp) moiety in a N3O6 surrounding. When Dy (III) and Yb(III) ions are used a field-induced Single-Molecule Magnet (SMM) behavior and Near-InfraRed (NIR) emission are respectively detected with magnetic and optical modulation depend the nature of the associated divalent transition metal. The second one, heteroleptic 4f-4f' dinuclear complexes of formula [Ln2-xLn'x(hfac)6(L)]□a(CH2Cl2)•b(C6H14) and [Dy1.11Nd0.89(tta)3(hfac)3(L)]. The coordination selectivity is based on the radius sizes i.e. the smallest lanthanide ion is mainly linked to the bzip coordination site while the biggest lanthanide is coordinated to the dpp coordination. Among the 4f-4f' series, SMM and NIR emission were studied. Ab initio calculations were computed to rationalize the magnetic properties.

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Predictions of the structural, electronic, mechanical and optical properties of inorganic lead bromide perovskite RbPbBr3

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Abstract: Lead Halide Perovskites have attracted attention in recent years as a promising class of solar-cell materials that shows high solar light-to-electricity conversion productivity with low-cost and easy manufacturing method [1]. For this purpose, we have conducted a theoretical works on the structural, electronic, mechanical and optical properties of inorganic lead bromide Perovskite RbPbBr3. The calculations have performed using the full potential linearized augmented plane waves (FP-LAPW) [2,3] method within GGA-PBE [4] formalism in ordered to describe the exchange-correlation potential. The obtained results showed that the equilibrium parameter values are in good agreement with the available results. For the mechanical properties, the obtained values reveal that our RbPbBr3 compound are mechanically and dynamically stable. For electronic properties, the band structures analysis indicate that our compound process semiconductor behavior. The optical constants indicated that our compound are promising semiconductor for optoelectronic applications and above a good candidate for photovoltaic applications. For all properties, the obtained results are staying in good agreement with experimental ones, and they are very close to theoretical values.

Site preference, magnetic, electronic and half-metallic properties of full Heusler V2FeAs and V2FeSb alloy: A first-principles study

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Abstract: In this work, a theoretical study was carried out on some physical properties of Heusler V2FeZ alloys (Z = As, Sb) in two regular and inverse structures. This study carried out by an ab-initio method known a full potential linearized augmented plane wave method (FP-LAPW) as implemented in Elk within the framework of density functional theory, the exchange and correlation potential was addressed by the generalized gradient approximation (GGA-PBE) and GGA + U. The structural optimization results obtained show that the site preference rule (SPR) is verified for V2FeSb (inverse Heusler structure), on the other hand, it is not verified for the V2FeAs compound (regular Heusler structure). The study of the electronic and magnetic properties of V2FeZ (Z = As, Sb) with the GGA + U approach, shows that are ferrimagnetic half-metals with integer magnetic moments, which are in good agreement with the generalized Slater-Pauling rule.

A roadmap for renewable energy sources, prospects of green hydrogen in Algeria.

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Abstract: The consumption of energy in industrialized countries is expanding by about 1% per year, and in non-industrialized countries by 5% per year [1]. At this rate, existing oil and natural gas reserves can cover consumption only for the coming 50 years for oil, and for the upcoming 70 years for natural gas [2]. The production of hydrogen as a potential solution for decarbonizing the energy supply has been under study since the early 1990s [3]. Hydrogen opens up the possibility for Algeria to not only eco-carbonize its existing energy consumption and provide a clean energy supply for everyone, but also to be an export of renewable energy. One of Algeria's most promising initiatives is to develop an international production and export pole in the hydrogen energy sector. In this regard, and in parallel with environmental accountability issues, there has been a gradual growth in public consciousness over the past decade. The strategic plan of the Ministry of Energy and Mines has a concrete goal of achieving a 40% share of renewable energy in electric power generation by 2030 [2]. The several upcoming developments are expected to give Algeria an important role in the deployment of renewable energy systems Africa. In this paper, the current state of technology regarding the hydrogen production pathways and renewable energy incorporation methods is reviewed. It highlights the key techno-economic drivers for Algeria to successfully transition and lead its own regional energy market.

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Structural electronic and optical properties of BxAl1-xSb an :ab initio Study

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Abstract: The structural, electronic and optical properties of the of BxAl1-xSb alloys have been investigated by using the full-potential plane-wave FP-LAPW method as implemented in the Wien2k code. The exchange-correlation (XC) energy of electrons was treated using the Perdewe-Burke-Ernzerhof parametrization (PBE-GGA), and the Tran-Blaha modified Beck-Johnson potential (TB–mBJ). The lattice constant and the bulk modulus have been calculated and analyzed where a deviation from Végard's law is observed for both. The calculation of the band structure of binary AlSb shows that there is an indirect gap of 2.27 eV, while for the BxAl1-xSb compounds there are direct gaps with values of 1.91 eV, 1, 39 eV, 2.04 eV and 1.849 eV for x = 0.25, 0.5, 0, 75 and 1, respectively. At ambient pressure, the refractive index and the dielectric constant are in good agreement with the experimental results. The extinction coefficient does not begin to increase until a threshold, which represents the optical gap. This threshold is equal to 1.224 eV and it starts to increase to reach a maximum at an energy of 3.551 eV.

Ab initio study of the structural, electronic, elastic and thermodynamic properties of chalcogenides AgSbX2 (X=Se,Te) in B1 phase.

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Abstract: We study the structural, electronic and elastic properties of the ternary chalcogenides AgSbX2 (X=Se,Te) for B1 phases, using full-potential linearized augmented plane wave (FP-LAPW) as implemented in the WIEN2k code. The exchange correlation energy is calculated by the generalized gradient approximation (GGA). Results are given for the lattice parameters, bulk modulus, and its pressure derivative. The band structure and the density of states were calculated and the results were compared with previous available theoretical calculations and experimental data. The quasi-harmonic Debye model, in which the phononic effects are considered, is applied to the study of the thermodynamic properties. The temperature effect on the structural parameters, bulk modulus, thermal expansion coefficient, specific heats and Debye temperatures in the whole pressure and temperature range from 0 to 800 K was presented.

Robust Tuning Parameters of Pid-Pss Using Ga under Uncertainty

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Abstract: In this paper, we proposed an advanced optimization method was using aslruhonvry algorithm applied for robust tuning parameters of conventional power system stabilizer realized on PID schemas (PSS-PID).this later is used as auxiliary of turbo generator excitation system in order to damp electro mechanicals oscillations of the rotor and consequently improve the stosikty of power system. Firstly we present the modeling and simulation of a conventional power system stabilizer (PSS-PID) .then we used Genetic Algorithms technique to find the best and the optimal tuning parameters of the conventional PSS-PID. Simulation results have proved that genetic algorithms are powerful tools for optimizing the conventional PSS parameters, and more robustness of the studied system type IEEE SMIB.

Theoretical prospecting of new materials for spintronics

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Abstract: First principles calculations, based on the density functional theory (DFT), were used to predict structural, elastic, electronic and magnetic properties of XBe3O4 (X=Li, Na, and K) compounds. These calculations were performed by employing the Full-Potential Linearized Augmented Plane Waves method (FP-LAPW) as implemented in Wien2k code. The compounds are energetically stable in their ferromagnetic phase, while only LiBe3O4 and NaBe3O4 are mechanically stable. Both stable ones are ductile and anisotropic. The electronic properties including the density of states and band structures indicate that these compounds exhibit half-metallic nature, with gap [half-metallic gap] of 7.73 eV [0.18 eV] and 5.57 eV [0.28 eV] for LiBe3O4 and NaBe3O4 compounds, respectively. The total magnetic moment is 1.0 μ_B for both systems, confirming their half-metallicity. The estimated Curie temperatures are 403.5 K and 422.9 K for LiBe3O4 and NaBe3O4 compounds, respectively. The obtained properties, such as 100% spin-polarization and high Curie temperature, required in technologies for fabricating materials for spintronic devices, make LiBe3O4 and NaBe3O4 as good candidates for these applications.

Effect of Ni toward the optical and transport properties of the spinel solid solution NixCu1-xFe2O4 nanoparticles

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Abstract: The solid solution NixCu1-xFe2O4 (NFCO, x= 0, x=0. 2,.x=1) prepared by sol-gel method after annealing at 800 °C crystallizes in a normal spinel structure. The structural, magnetic, optical, electrochemical and electrical properties were investigated. The formation of the tetragonal phase with a good crystallization quality and stoichiometric content were confirmed by X-ray diffraction(XRD) (= 0 and 0.2) while a transition to cubic symmetry is observed for the other compositions. Magnetic measurements reveal that saturation magnetization value (Ms) increases as the amount of Ni in the structure increases whereas the coercivity decreased. The transport properties are characteristic of n-type behavior where the electrical conductivity decreases up to x = 0.4 and then increases above this value, and is governed by the thermal emission over the inter -crystalline. The optical properties namely the energy gap (Eg), reflection index (n), extinction coefficient (k), dielectric complex (ε), optical conductivity (σopt), dissipation factor (tanδ) and relaxation time (τ) were determined.

Examination the impact of addition titanate on the dielectric permittivity of binary composite materials

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Abstract: For decades, composite materials have been studied because of their importance in various technologies, particularly in microwaves systems, due to their electromagnetic wave absorption properties. The infinite objective of researchers is to optimize the use of known materials on the one hand and especially to be able to predict new materials on the other hand by using several characterization techniques. Our work is devoted to the study the complex permittivity of a binary composite based on epoxy resin and titanate under the action of an electromagnetic field using a microwave test bench. The composites are mixed at a room temperature in different volume fractions. where several samples of different thicknesses have been carried out to see the titanates influence on dielectric behavior in the X-band. Our measurements were extracted using two devices (SWR-meter and Millivoltmeter) then they are processed in a mathematical language called "Mathematica". The results obtained demonstrate that the real part of permittivity rises with increasing titanate concentration. This study interest lies on an application of these materials in microelectronics and particularly in telecommunication components manufacturing.

SEM and AFM study of radiation damage induced by neutron transmutation doping of silicon

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Abstract: In this paper, the change in the morphology and the surface topology of CZ-Silicon were study before and after irradiation at the Es-salam reactor. The morphology a property of CZ-Si was analyzed by Scanning Electron Microscope (SEM) and the surface topology was observed using Atomic Force Microscope AFM in contact mode. The results showed that neutron irradiation introduces a rectilinear path of black spot defects in the surface of CZ-Si material. The effect of isochronal annealing on the topological property was studied. We employ a 3D AFM measurement technique to directly quantify the surface quality and estimate the Root Mean Square □RMS□, the neutron irradiation has induced increase of the surface roughness at higher fluence. The root mean square increases with the increase of the neutron fluence and decreases with increasing of annealing temperature. This occurrence can be correlated to the polite surface material. The results of these studies have known an essential contribution to the understanding of silicon damage process by neutron irradiation.

Prediction of Half-metallicity in the New Heusler CsScN2 and CsScO2 Compounds

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Abstract: The purpose of this work is to further understand the structural, electronic, and magnetic properties of the alkali-metal based Heusler alloys CsScX2 (with X = O and N) by using the linearized augmented plane wave method (FP-LAPW) which is based on density functional theory (DFT) and implemented in the WIEN2k code. The GGA approach was used for the exchange and correlation potentials.The structural stabilities revealed that the L21 phase of the Cu2MnAl-type structure is the most stable for our compounds. The results obtained from the magneto- electronic properties showed that the CsScN2 compound is a HMF material. The calculated magnetic moment is $2\mu B$, and it is in good agreement with the Slater-Pauling rule for CsScN2 compound. These findings allowed the CsScN2 compound to be a promoter candidate for spintronic applications and flavored it for experimental research .

Investigation study of a small-scale parabolic trough collector coupled with the Organic Rankine Cycle under the Algerian climate

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Abstract: The power plants based on Parabolic trough collector (PTC) are the most renowned solar concentrating technology worldwide). Generally, the PTCs are used in various applications of medium and high-temperature levels as well as electric production. For this, many studies examine their efficiency and production capacity to replace conventional energies. Regarding the increase of the different PTC configurations thermal efficiency studies, the reduction of the Levelized Cost of Electricity (LCOE) and the development of a small compact designs are investigated. This study concerns a small-scale PTC coupled with an ORC cycle (Turboden) to ensure the production of electricity. Furthermore, we take into account the electricity bills of two different houses in Algerian's areas; Tizi Ouzou and El-Oued, from where we estimated the annual electrical power consumption and deduced the outlet power of the ORC cycle. Based on the previous needed power, the solar field was sized to ensure the proper operating of the considered system. The used tools are Excel for the calculation of the ORC cycle and the GREENIUS software for the simulation and solar field sizing. Consequently, the obtained result showed that the influence of the DNI on the produced power using the PTC is noticeable: for example, during the spring equinox day, the installations produced about 230, 185 [kW] for El Oued and Tizi Ouzou respectively.

Study Of The Dispersion Efficiency Of Kenics Type Static Mixers

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Abstract: The influence of the geometrical parameters of a KENICS static mixer was studied by exploitation of the drop pressure and therefore the combining potency of a flow of a Newtonian fluid with an occasional price of Reynolds variety (Re=0.1- 100). The results of this numerical simulation were dispensed to match the efficiency of changing styles of static mixers with the initial case. The simulations were performed with the business code ANSYS CFX 18.2 for streamline flow of The numerical modeling began within the RANS modelIn this work.

DFT theoretical investigations of π-conjugated molecules based on thieophene and fullerene derivatives for organic photovoltaic cells

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Abstract: Materials based on π-conjugated organic molecules are increasingly attracting attention for photovoltaic energy research fields. This interest due to their specific properties such as low cost and easy elaboration. In this work, theoretical study by using the density functional calculations (DFT) method were performed to investigate the electronic and optical properties of fullerene C60 and a series of polythiophene (C4H4S)n. Thus, our aim is first, to explore their electronic and spectroscopic properties on the basis of the DFT quantum chemical calculations. Second, we are interested to elucidate the parameters that influence the photovoltaic efficiency toward better understanding of the structure-property relationships. We performed calculations using the B3LYP / 6-31G (d, p) base to obtain the most stable optimized conformations using the GAUSSIAN 09-D program. The visualization of the molecules after optimizing the geometry was carried out by the GaussView 06 program. Minimal energy structures for each compound were obtained. For all compounds, the highest occupied molecular orbitals (HOMOs), the lowest unoccupied molecular orbitals (LUMOs) and the Gap energy were calculated and compared with literature. The results show the possibility of controlling the optical and electronic properties of the donor material by playing on the length of the polished chain. Molecular modeling by the DFT method may be an essential tool for predicting the main parameters that control the performance of an organic solar cell, before moving to synthesis.

The characterization of date palm leaflet as renewable materials for using as green materials in constructions

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Abstract: The objective of this work is the characterization of the Date Palm Leaflets (DPL) as a renewable material aims to better understand these components and better use it in its ideal position. The present study examined the physical and chemical properties obtained using Fourier Transform Infrared Spectroscopy (FTIR), X-ray Diffraction (XRD) and SEM/EDX. Three types of Deglet Noor's from different region (Mekhadma, Bouchagroune and Lichana) are used as study samples named S1, S2 and S3, respectively. The results of the XRD analysis show that the crystalline levels are respectively S1 (42.9%), S2 (62.12%) and S3 (62.83%). Note that the crystallite size results show that the change in region of collected DPL changed its size dimensions as follows; S1 (2035.9 nm), S2 (2026.6 nm) and S3 (2035.9 nm), respectively. The FTIR test showed the presence of cellulose, hemicelluloses and lignin in the three samples.

Anion exchange, x-ray diffraction, infrared spectroscopy of a novel layered double hydroxide

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Abstract: The minerals most commonly used are those made of clay. Among these materials, the anionic clays have drawn the most attention because of their properties. They now make up a family of materials with a very diverse range of applications and press chemical bonds that are highly anisotropic, allowing a wide range of organic or inorganic species to be inserted. Using the co-precipitation approach and potassium hydroxide or aqueous ammonia solution to regulate the solution's pH, carbonate forms of layered double hydroxides (LDHs) were created. The effects of the synthesis conditions on the structural and textural characteristics, as well as the anion exchange of the LDH products, utilizing distinct molecules: NaVO3, Na2S2O3, NH4Mo7O24•4H2O, NaC12H25SO4, and K2SO4 that were examined and characterized by X-ray diffraction and FTIR spectroscopy and compared to synthesized LDH.

Application of the MPPT Control in the photovoltaic system of the Oued Elkebrit-Souk Ahras-

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Abstract: In order for photovoltaic systems to operate at peak power points according to their characteristics, there are specific control laws that meet this need. This command is called in the documentation "Maximum Power Point Tracking" "MPPT". The principle of these controls is to look for the maximum power point while keeping a good match between the transmitter and its load to ensure maximum power transmission. There are many MPPT control methods and techniques available in the literature, including three classic methods: Perturbe and Observe (P&O), Conductance Incrementation (IncCon) and Hill Climbing.Currently there are methods based on artificial intelligence namely: fuzzy logic, and neural network and genetic algorithms. this control technique was implemented in the simulation of the photovoltaic power plant of Oued ElKebrit located in the city of Souk Ahras ' North east of Algeria ', the simulation results were presented and discussed.

Influence of photovoltaic panel manufacturing material on plant efficiency

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Abstract: The basic material currently used in the manufacture of photovoltaic panels is silicon. This substance is found in very large quantities on our planet because it constitutes about 28% of the Earth's crust. In fact, it is found mainly in the form of silicon dioxide, the main component of sand. It is therefore abundant and inexpensive. there are photovoltaic cells based on monocrystalline, polycrystalline or amorphous silicon. each type of material offers characteristics to the photovoltaic system in terms of view, efficiency, cost and production methods. Due to the technology of new materials, cadmium telluride (Cd Te), gallium arsenide (GaAs) and copper and indium di séléniure (CIS) have made it possible to obtain solar cells with an acceptable efficiency. in this study, a simulation of a photovoltaic power plant was carried out based on the PV.system software by studying the influence of the material used in the manufacture of photovoltaic panels on the efficiency of the plant, a comparative study was carried out and discussed.

Al Doped TiO2 thin films prepared by sol–gel method for waveguiding applications

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Abstract: In this work, we present the preliminary results about the preparation of sol-gel Al: TiO2 thin films prepared on glass substrates and particularly the study of their waveguiding properties. Optical properties of TiO2 thin films are investigated for different doping (0, 3 and 7% wt.). The obtained films are transparent in the visible range and opaque in the UV region. The band gap energy increases from 3.55 to 3.63. Waveguiding properties are studied using M-lines spectroscopy. The best results indicate that our films are monomodes (for both TE and TM polarizations) at 632.8 nm addition, the analysis by (M-Lines) also helped us to extract values for the refractive indices (n(TE) & n(TM)) of these films, which is between 1.8140 and 2.4034 for TM mode, and between 1.8908 and 2.0508 for TE mode.

Experimental study of dried loquat under vacuum and indirect solar dryers in semi-arid regions of Algeria

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Abstract: The existing solar energy in semi-arid regions is a non-polluting economical and viable source used in several fields such as drying. This work studied the importance of using an indirect solar dryer, which was made inside the Laboratory of study of Industrial Energy Systems (LESEI), university of Batna 2. Comparing the results with the use of vacuum dryer, to evaluate drying parameters of a local loquat variety. Tests were conducted under several experimental conditions as follows. First, in solar dryer at natural and forced air convection. Second, in vacuum drier under temperature of 50° C with three different air vacuum pressure levels (20, 40 and 60 cm Hg). The values of Pro-vitamin A (PA) varied from 82.2 to 110.7 µg/100g, while rehydration capacity (CR) varied from 47%to 81%. Comparison of these two experimental drying methods and calculated results shows that vacuum drying is the very fast method, however, forced air convection is four times faster than natural convection one. The best results were found with vacuum 20 cm Hg and forced air convection. The mathematical model of (Midilli and al) gave the best results for describing drying kinetics of loquat.

Validation by Simulation and Experimental Dosimetry Measurement of the CLCCT's Linac Irradiation Head in Small Field Radiotherapy

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Abstract: The X-ray small fields are a novels radiotherapy beams that are designed for very small sensitive tumor sizes treatment, which located for example in the brain, lungs or heart. They can minimize the exposure of healthy tissue to the risk of toxicity, thus ensuring an accurate conformation of radiation dosimetry to tumor volume. This study reports the small field dosimetry measurement results and the validation of a Monte Carlo (MC) model of the CLCCT's LINAC. The Varian TrueBeam Linac measurement system produces a 6 MV flattening filter (WFF) X-ray beam and consists of a phantom (1D cubic), at 10 cm depth of measurement and 100 cm source surface distance (SSD). The geometric field sizes ranging from 1x1 to 3x3cm jaws defined and the machinespecific reference field size was 10x10 cm. Three types of detectors were used in this work, the PTW Semiflex0.125cc, the PinPoint3D ionization chamber and the EDGE (Sun Nuclear) detector. The detector orientation with respect to the central axis of the beam was set following the guidelines in the IAEAAAPM TRS-4832 code of practice. X-ray small-field beam dosimetry profiles and the yield at depth were also measured using three types of detectors (EDGE diode, PinPoint3D ionization chambers and Semiflex0.125cc). Output factors of fields ranging from 1×1 to 10×10 cm2 were measured. Output correction factors k of the Edge detector for a DSP=100cm and DSA were calculated for validate the measurements with respect to the MC-Gate simulation. This comparative study made it possible to successfully describe the variation of the measured dose as a function of the depth and the size of the field. The terrain profile 3x3cm^2 shows a good agreement between the results of the MC calculations and the measurements made with the 0.34 cm EDGE penumbral diode and ionization chambers PinPoint 3D, Semiflex 0.125 penumbra 0.43, 0.53 cm. This is beneficial for the performance of the treatment in radiotherapy based on mini-beams. On the other hand, the profile of the field 1cm revealed a shift of about 0.29 penumbra between the results of the MC calculations and the measurements made with the EDGE diode, a penumbra detuning of 0.36 for the case of a PinPoint 3D and it goes to 0.40 penumbra for the case of the Semiflex chamber 0.125. Finally, the validation of the clinical conditions of the various components constituting the CLCCT's TrueBeamSTx irradiation head was successfully carried out.

SrTiO3-δ synthesis, characterization and application in photodegradation

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Abstract: The perovskite SrTiO3-δ, synthesized by nitrate route, was identified by X-ray diffraction. The SEM analysis was used to visualize the catalyst morphology. A band gap of 3.32 eV was determined from the diffuse reflectance spectroscopy. The n-type semi-conductivity was demonstrated from the capacitance measurement with a flat band potential (Efb) of - 0.31 VSCE. The conduction band (-0.60 VSCE) and the valence band (+2.72 VSCE) permit to generate the radicals O2•- and •OH respectively. The photo-catalytic efficiency of SrTiO3-δ was tested by the Chloro-Tetracycline and Congo Red oxidation under UV light.

Removal of cationic dye from aqueous solution by Fenton's oxidation

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Abstract: In this work, the oxidative degradation of a cationic dye, Crystal Violet (CV) in aqueous solution by Fenton's (Fe2+/H2O2) process was investigated. Since, the degradation of the dye by Fenton's oxidation process can be affected by different operating parameters; the oxidation process in batch reactor has been conducted by considering several operating conditions such as: Fe2+ and H2O2 concentrations and initial pH of solution. The experimental results obtained show that the optimal conditions for degradation of 99.99% of Cristal Violet were determined as a concentration of the oxidant [H2O2] and catalyst [Fe2+] about 3.133mM and 0.2mM respectively, initial pH solution of pH= 3 and temperature solution 25°C. These conditions were established for an initial concentration of the Crystal Violet of [CV]0=10 mg/l.

The influence of powdering the plant on structural and photocatalytic activity of nanomaterial synthesized by Green method

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Abstract: Nanomaterials have large -scale applications and have been an important subject in the fields of basic and applied sciences. In the recent years, there has been great attention to nano-sizes semiconductors because of their new properties that have Optoelectronics applications. These nanoparticles have excellent chemical and thermal stability. Various approaches for the preparation of ZnO-NPS have been developed, such as sol-gel, hydrothermal and precipitation methods. Biosynthesis provides nanoparticles of sizes and morphology better defined in relation to other physicochemical methods. Zinc oxide nanoparticles (ZnO-NPs) were synthesized by ecological method from rosemary (Rosmarinus Officinalis). Using the aqueous extract and a zinc salt (zinc sulfate) as a precursor. Two methods of extraction were realized, using the plant as it is and on the other hand the crushed plant (powder). The synthesized nanoparticles have been characterized by spectroscopy (UV-VIS), Fourier transform infrared (FT-IR) spectroscopy and X-ray diffraction analysis (XRD). The formation of zinc oxide nanoparticles was confirmed by XRD, the results revealed the formation of the hexagonal wurtzite structure with the average size (34) nm. UV-Vis spectra showed typical absorption peaks around 375 nm, and this because of their great energy of excitement at room temperature. The ability of ZnO-NPs to degrade a pollutant has been evaluated in photodegradation tests. The degradation yield for a period of 3 h is relatively large, it exceeds 96% by using the plant. The tests have shown that the degradation yield decreases by using the nanomaterial synthesis with the powder.

Development and characterization of a new material from an algal biomass - application to the removal of Methylene Blue-

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Abstract: Water is a precious element essential to life, this natural resource covers three quarters of our planet, with only 0.014% of fresh water. Indeed, water has a fundamental role in many fields such as drinking water treatment, agriculture, industry, electricity production and domestic uses. Water is becoming increasingly scarce and its quality is deteriorating due to pollution. Currently, activated carbon is the most commonly used, activated carbons are defined as highly porous carbonaceous materials that have a large specific surface area with high porosity, hence the exceptional adsorption properties. Agricultural wastes attract the attention of green chemists for their great availability. This study was devoted to the valorisation of the Mediterranean seaweed known as Ulva lactuca or sea lettuce (green algae). The aim of this study is to prepare and characterize calcined activated carbon based on seaweed.and then the application to the adsorption of a cationic dye Methylene Blue present in industrial effluents. Finally we can conclude that our new material is a real competitor for the commercial activated carbon and that the mode of activation is very effective with a removal rate of about 90%.

Optical energy splitter based on photonic crystal fibers

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Abstract: Optical fiber has become the most widely used transmission medium for high speed applications. However, the standard fiber has several limitations such as chromatic dispersion

These FMAS consist of a periodic arrangement of air channels parallel to the direction of propagation in a matrix of pure silica with the elimination of a channel in the center of the structure thus forming the heart of the fiber. This new optical fiber, which gives it new properties, all these properties have made it possible to integrate these fibers in several fields such as telecommunications, sensors, etc. A new generation of fiber is being imagined with the aim of obtaining lower losses than conventional fibers. We carried out a purely theoretical work based on the modeling and the numerical simulation of the various propagation parameters in the PCFs. The aim of this work is to study the behavior of a PCF-based divider by showing that the energy is confined in the cores while observing losses at the level of the cladding.

Integrating of useful substances material in renewable energy development from the Algerian Sahara: a review of potentialities

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Abstract: Algeria, the largest country in Africa in term of surface, yields an important potential to be one of major solar energy countries. The northern Sahara is not only characterized by a high sunshine, but also contains various useful substances including the necessary raw materials which can further support the production of solar panels and the storage of energy. The present study aims at synthesizing the main useful substance existing in northern Sahara of Algeria, and emphasizing their characteristics and resources distribution in the studied area. The Algerian desert's sand dunes alone cover more than 500,000 km2 representing a quarter of Algeria's area. For instance, the Grand- Erg-Oriental, with an approximate area of 120,000 km2, consists in a large reservoir of natural sand dunes contain fluvial and aeolian deposits [1,2] originated from various geological sources. The sand material was proved essential for multiple uses in engineering, chemistry, physics, environment and biology fields. Moreover, sand is rich in quartz (silicon dioxide) that extensively used in in the glass industries and in manufacturing solar cells [1,2]. In recent years, many studies [3,4,5] have revealed that sand from different locations (Ouargla, El Oued, and Bechar) yields SiO2 contents varying from 72 to 98 %. The large resources of pure sand can represent a local low-cost raw material in the production of solar cells. The natural brines in Algerian Sahara are extremely saturated and considered as complex solutions containing one of important sources of strategic minerals such as lithium in salt lakes. They can be classified among the most important renewable natural resources, due of their large areas, especially in southern Algeria which hosts many saline chotts [6,7]. According to Zatout et al. [8], the Merouane and Melghir chotts display a surface up to 1840 km2. In these chotts, brines can contain up to 66 mg (L-1) of lithium. These potentialities of lithium present a significant key in the fabrication of Li-ion batteries representing till up to date the major energy storage solution in off-grid renewable energy [9]. Gypsum soils are widely found in arid and semi-arid areas in the worldwide. Algeria witnessed approximately 7966.3 km2 representing 12.2% of the world's gypsum soils [10] with a content of (CaSo42H2O) than can reach 70% [11]. The integration of the gypsum in traditional construction habitat lies within the energy conservation techniques as this material can allow a climatic adaptation in harsh climates as in the Saharan regions. According to Fezzai et al. [12], the energy behavior of these buildings is suitable to hot and arid climates and allows the reduction of energy consumption as well as limiting greenhouse gas emissions (Energy savings in buildings) together with a comfort conditions where the difference between outside and inside temperatures can reach up to 10 °c [13]. Therefore, for an efficient energy saving in buildings, the local materials with high thermal inertia in the development of urban fabrics should be used in the Saharan environment. This study highlights the potential of the local useful materials that can be used for a best energy transition basically for the production of solar panels and Li-batteries in addition to the saving energy methods. A multidisciplinary research program is highly recommended to valorize these local capacities of the useful substances to move some of the renewable energy forward in Algeria.

Biopiles microbienne à base de microalgues une application pertinente des énergies renouvelable

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Abstract: In this paper, we evaluated the efficiency of electricity production from fuel cells microbial. The cell has three parallel electrodes, the aluminum plate as the anode is halfway between the two cathodes, the distance between each electrode is 3 cm. The anode is immersed in urban wastewater with microalgae Chlorella (pyrenoidosa). The cathodines are immersed in sewage. The submerged part of the electrodes was 6cmx2.5cmx0.1cm with a submerged area of 90cm2. This experimental installation allowed us to produce electricity through biofilms with Electrical activity EA, which are bacterial unions, have the ability to exchange Electrons from their metabolism with solid conductive surfaces for electrodes. Cell: the maximum voltage is 0.61 volts, the maximum current is 19.83 mA and the maximum power is 12.09 mW. can provide this results Evidence for the implementation of a complete process for wastewater treatment and electricity production.

Comparative analysis of the chemical synthesis of rare earth Cerium doped cobalt ferrite nanoparticles

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Abstract: Using two different chemical processes, Co-precipitation and the sol-gel technique, doped cobalt ferrite nanoparticles are synthesized. Structural, micro structural and elementary properties of the obtained samples are checked by X-ray diffraction and Scanning Electron microscopy (SEM). Thermal analysis of the powders was investigated using simultaneous DSC/TGA (differential scanning calorimetry and thermo gravimetric analysis).

Solving a Nonhomogeneous Multi-Pantograph Equations using the Adomian Decomposition Method

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Abstract: The multi-pantograph is a kind of a pantograph, it is an apparatus mounted on the roof of an electric train, tram or electric bus to collect power through contact with an overhead line. By contrast, battery electric buses and trains are charged at charging stations. The pantograph is a common type of current collector; typically, a single or double wire is used, with the return current running through the rails. The nonhomogeneous multi-pantograph equation arises in the problem of analyzing the dynamics of an overhead current collection system for an electric locomotive (see [3]), electrodynamics (see [2]) and engineering applications (see [1]). In this work we use the Adomian decomposition method to find an approximate solution for a nonhomogeneous multi-pantograph equation. The convergence of the approach for this equation is established. We also give some examples and numerical results to illustrate our results.

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Structural, Electronic And Magnetic Properties Of Diluted Magnetic Semi-Conductor

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Abstract: This work studies the structural, electronic and magnetic properties of material Zn1-xTMxS(TM = Cr,and x= 0.25, 0.125, 0.0625) in the phase Wurtzite.We work on the semi-conductor composed (ZnN) of calculation of the first principal based on using the Density Functional Theory (DFT) by using the method of the Full-Potential Augmented Plane Wave (FP-LAPW),and the Local Spin Density Approximation(LSDA) implemented in Wien2K[1] code ,to determine the exchange-correlation potential. We analyzed the dependence of structural parameters with concentrations x=0,25, x=0.125 and x=0.0625.Our calculations verify the half-metallic ferromagnetic behavior with spin polarization of 100% at the Fermi level. All compounds having large HM gap in their electronic structures appear to be leading candidates as half-metallic ferromagnetic materials for spintronic applications.

High photocatalytic efficiency of a natural hematite for pharmaceutical products degradation

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Abstract: This study is part of the depollution of water, it aimed to examine the photocatalytic degradation of the antibiotic ciprofloxacin in aqueous solution, in the presence of a natural iron oxide (hematite) and the hydrogen peroxide (H2O2). Natural hematite has been activated by artificial ultraviolet (UVC) irradiation. In order to optimize the photocatalytic parameters, a screening technique, by the fractional factorial plan, makes it possible to plan the tests. The five parameters selected are the concentration of ciprofloxacin (CIP), the concentration of H2O2, the dose of hematite (α-Fe2O3), the pH and the temperature of the solution. The composite central design (CCD) employed to model a second-order response surface. The effects of [CIP], [H2O2], α-Fe2O3 concentration and temperature on the degradation efficiency was evaluated. The rate of degradation increases as a function of [H2O2]. Hydrogen peroxide reduces the recombination of electron-hole pairs by trapping electrons from the conduction band.The maximum CIP degradation reduction rate is 91.9%, is obtained in test No 18, under the experimental conditions of [CIP]0 = 125 (mg. L-1); [H2O2]0=0.05(mol.L-1); [Fe2O3]0 = 1.2 (g.L-1); pH=5.8; T = 30°C.

Study of the half-metallic behavior in SrMnO3 perovskite by ab initio DFT calculations

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Abstract: Nowadays, perovskite-based materials (PBMs) have attracted great attention because it was reported that films from PSCs were successfully recycled and retain their main crystal structure. PBMs offer wide range of applications such as spintronics, photovoltaics, LEDs, solar cells, magnetic memories, and multiferroics. In the present research, in-depth computational study by employing ab-initio calculations has been carried out to investigate the structural, electronic, and magnetic properties of SrMnO3 compound using the full potential linearized augmented plane wave (FPLAPW) based on density functional theory (DFT) implemented in the Wien2k code. The exchange-correlation potential is treated by the generalized gradient approximation GGA-08. The SrMnO3 perovskite crystallize into a cubic structure with an experimental lattice parameter a=3.86A°. The total energy (Etot), lattice constants (a), bulk modulus (B) and its pressure derivative (B'), total and partial density of states (TDOS, PDOS), the electronic band structure, and the total and partial magnetic moments MT (μB), MSr (μB), MMn (μB), MO (μB) are computed and discussed. The ferromagnetic and non-magnetic phases of SrMnO3 have been examined and the obtained results confirm the stability of the ferromagnetic state. Furthermore, SrMnO3 is found to exhibit a half-metal character with interesting thermometric characteristics. The obtained results demonstrate the potential use of SrMnO3 compound in spintronics-/energy- based devices.

Laser-induced plasma parameters dependent of laser pulse number for vanadium dioxide smart thin films deposition

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Abstract: Thin films of vanadium dioxide (VO2) have been considered of great interest due to their exceptional semiconductor to metal phase transition characteristic for high potential smart applications. Laser-induced plasma has widely used to deposit vanadium dioxide thin films. Oxygen pressure, laser fluence, target to substrate distance, and substrate temperature are parameters that has been used to tune films properties. The laser pulses number used for the deposition is a parameter that was generally ignored. In this contribution, we analyzed the effect of the laser number pulses on the species emission intensity, the electronic density and temperature of vanadium oxide plasma at different laser fluences. The analysis was done using optical emission spectroscopy technique. We found that the plasma temperature is a more sensitive parameter to the laser pulses number. Consequently, we have defined ablation time intervals for which the plasma parameters remain constant during the deposition time. This will ensure the growth of homogeneous thin films with desired and precisely controlled properties for high-performance functionalities.

Computational Fluid Dynamic Simulation of Micro-combustion for Thermo-photovoltaic Devices

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Abstract: In modern life, portable electric energy needs, for future, have increased with the ongoing technological development. The traditional batteries are no longer able to satisfy and fill these future needs regarding their disadvantages, such as their limited energy densities and heavier weight. Micro-thermophotovoltaic (MTPV) systems have been presented as suitable solution. The MPTV devices are smaller, and provide tiny and powerful energy. The system consists on transforming the chemical energy emitted by the micro-combustion of gaseous fuel to thermal energy, and then to electrical energy by heat radiation. The present investigation introduces a novel micro-combustor for MTPV application. The micro-combustor is a modified version of the conventional backward step design and features an additional aft-body to create a trapped vortex. This design is inspired from the propulsion and power combustion systems and its suitability for micro-scale application will be assessed using computational fluid dynamics in this study. The investigations are carried out under laminar flow regime, conjugated heat transfer, premixed hydrogen-air, lean combustion with $\Phi = 0.8$ and various inflow velocities. The results indicate that the trapped vortex design is very suitable for micro-combustor application since it enhances the flame stability and removes the flame blowout compared to the conventional design. The twin vortices formed in the cavity and downstream the aft-body are responsible of increasing the combustion intensity as the inflow speed increases. Consequently, both the conductive and radiative heat transfers are intensified through the bottom wall, which is very beneficial to MTPV systems.

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The energy strategy in Algeria: Policy and obstacles to an energy transition, Case of the future Annaba metropolis

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Abstract: Optimal energy management is an increasingly important consideration for all segments of the economy at the global, national and local levels. The International Energy Agency (IEA) approximates at 1.5% the annual increase of global energy demand by 2030. According to these estimations, energy demand in 2030 would be twice that of 2008. Energy consumption is strongly dominated by fossil fuels, which represent 80% of primary energy sources. However, such unrenewable sources are unevenly distributed and their production is well known for being responsible for about two thirds of greenhouse gas emissions. Around the world, policymakers agree that efficient energy management would be beneficial in several ways. From a financial perspective, better energy management saves money, while from an environmental perspective; renewable energy remains an alternative option to fossil fuel use. The actual recourse to fossil energy is at the origin of both economical and environmental .The energy crisis generating hence several questioning around matters such as of how to meet to the growing energy demand and in the meantime intervene upon climate change variation. Pragmatically, the issue is to identify obstacles that may hinder energy transition and then put forward strategies that may possibly boost it., Upon this basis, the authors' proposal aims to discuss the case of Annaba through its new city project "Draa Erich" which is sustainable according to its actor EPIC. How to progress towards an energy transition strategy with a pragmatic approach, considering that the building sector is the most energy-intensive and budgetary? What are the obstacles?

Existence of solutions for hybrid fractional differential equation model of the thermostat with hybrid boundary conditions

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Abstract: The theory of fracttional differential equations plays an important role in the modeling of many processes physical, technological and biological. In recent years, a great attention has been focused on the study of the existence and uniqueness of solutions for the fractional differential equation. Fractional differential equations are considered a generalization classical differential equations. The main objective to study the existene of solutions for a probleme hybrid fractional differential equation model of the thermostat in banach space c([0,1], x). Where we used fractional derivation in the caputo sense. The results obtained are based on the techniques of fixes point. We consider the hybrid differential equation of fractional With the three point hybrid boundary conditions Where and is the fractional derivative of caputo . The functions are continuous . We start with present the necessary concepts of fractional derivation and preliminaries, then we presnte existence result of solution for fractional system. For this we used the nonlinear alternative of schaefer's fixed point and we finish with result (the fractional hybrid problem (1)–(2) has a solution in [0,1]).

Biosensors based on nanomaterials for the electrochemical determination of lead ions

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Abstract: Heavy metal ions are highly toxic to human health. Furthermore, at trace levels, their toxicity actions are irreversible and harmful. determining them is critical, particularly in aqueous solutions. Electrochemical biosensors are a very useful tool for monitoring these substances in small quantities in real time. In this work, we attempt to build an electrochemical biosensor using nanomaterials and conducting polymers to form a sensing platform. In addition to the biological element E.coli to effect of intra enzyme to ability detect lead ion. To improve the analytical performance of the constructed biosensor, the immobilization method of the biorecognition element at modified electrode was also used. The analytical properties were evaluated and compared to recently developed biosensors for lead ion detection. The developed biosensors were highly selective for lead ion. The sensitivity was discovered 30μA/μg.l-1.

A new ceramic material's morphological study PZT

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Abstract: The main objective of this work is about synthesis, structural and physical characterization of a new ceramic material PZT of perovskite structure ABO3 with substitution in the site A and B which was carried out in order to ameliorate its physical properties. The samples selected for this study were prepared by the method of synthesis in a solid way. A thermal treatment was applied to these compositions at different temperatures: 1100 °C, 1150 °C, 1180 °C and 1190 °C successively in order to optimize the sintering temperature where the density of ceramics is at maximum (near theoretical density) and therefore the product is better physical quality. Different techniques of characterization were used such as scanning electron microscopy (SEM), X-ray diffraction (XRD) analysis and IR.

Theoretical study of thulium-doped optical fiber laser (TDFL)

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Abstract: The researchers were able to doped the glass fibers with some rare earth element ions such as Tm+3 to obtain high gain amplifiers, these fibers were not only used in amplifiers but were also used to be used as an active media for the production of optical fiber lasers., such as the thulium-doped optical fiber laser (TDFL). In this work, we study the spectroscopically of the thulium laser in glass and take the thulium-doped optical fiber laser (TDFL) as an example, on which we evaluate our study, through the numerical solution of the descriptive differential equations to enumerate the energetic levels of the thulium ion using the Matlab program, to extract the required results. We proposed a simplified three-level model of the thulium laser and through it we numerically solve the equations for the time change of the population in terms of the puissance pump. The obtained results were also compared with previous theoretical and experimental results. The results of this study were good, which encourages a more complex study, taking into account the various phenomena affecting the operation of the laser.

Physical properties of the new MAX phases Mnn+1SiCn: ab-initio calculations

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Abstract: In this work, we have studied the structural, electronic, elastic, and thermodynamic properties of the new Max phase's class MnSiC2, Mn3SiC2 and Mn4SiC3 using the linearly augmented plane wave method based on density functional theory. The exchange-correlation potential is treated with the local density approximation LSDA. The formation energies calculated for all compounds showed that these compounds are thermodynamically stable. We found that the ferromagnetic configuration is more stable than the non-magnetic one, at their lattice parameters for all three compounds. Cohesive energy confirms the structural stability of all structures. The total magnetic moment increases with an increasing value of n. The band structure indicates that the three materials are electrically conductive. For the density of state, we see that there is no gap for these three materials; they exhibit a metallic nature which results from the fact that the Mn-3d states are dominant at the Fermi level. The peak of hybridization of the Mn–3d, and C–2p states leads to a strong covalent bond than that between the Mn–3d and Si–3p states in the low energy domain. 3p electrons in silicon elements can effectively alter the covalence and iconicity of bonds that govern compressibility, ductility, and even superconducting properties.

Investigation of temperature-dependent electrical properties in Cu2SnS3 by Hall effect measurements

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Abstract: The Cu2SnS3 (CTS) single crystal was prepared by melt growth method heating in the stoichiometric mixture of Cu, Sn and S. The elements were sealed in evacuated quartz ampoules to a pressure about 10-6 Torr. The ampoule was Inserted into a Carbolite tubular furnace. Initially it was heated from room temperature to 1100 °C in three steps with different rates, at a rate of 0.5, 0.5 and 2 °C/h. The molten mixture was kept at this temperature for 24 h. It was later cooled at a rate of 0.5 °C/h up to 1000 °C. The ingots were annealed at this temperature for 12 h. then at 0.5C/h to 600 °C. The cooling rate from 600 to 300 °C was 0.5 °C/h. The furnace was then turned off and the ingot cooled down to room temperature. Electrical parameters were carried out by Hall Effect measurements. The p-type material was observed. At room temperature, carrier concentration (p), conductivity (σ), mobility (□) and bandgap energy were 9.55 x 1014 cm-3, 1.94 x10-1 Ω-1cm-1, 1.27x103 cm2/Vs and 0.92 eV, respectively. Measurements at low temperatures (80 K – 300 K) were carried out. Activation energy and thermal impurity-to-valence band activation energy of 163 meV in range temperature (120 K – 133 K) and 105 meV (230 K – 264 K) were determined from Arrhenius plot of ln (σ) and ln(p) versus 1/T respectively. The observed scattering mechanisms in are attributed to ionized impurities and acoustic phonons at low and high temperatures, respectively

Effect of the hybrid nanofluid (Ag–CuO/water) on the heat transfer characteristics by natural convection in a square cavity: numerical study

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Abstract: Ventilation and cooling technology is used by an underground air duct system and a Wall Trombe, which is an effective process of reducing the temperature of the room, thus reducing the cost of the electricity bill on the individual and on the government,

Microstructural and Morphological study of Ti/TiN/TiAlN Thin Layers Deposited by PVD Magnetron Sputtering

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Abstract: In this study Ti/TiN/TiAlN thin layers were deposited on silicon substrate by rf/dc magnetron co-sputtering. The effect of nitrogen flow rate on microstructural and morphological Ti/TiN/TiAlN coatings was investigated. The structural and morphological analyses performed by using X-ray diffraction, field emission scanning electron microscopy (FE-SEM) and atomic force microscope (AFM) techniques showed that the coatings have a crystalline structure, consisted of fcc (Ti,Al)N phase. The orientation of the coatings depends on the N2 gas flow rate. The (111) (200) and (220) planes of TiAlN thin films were found with different nitrogen flow rates. At N2 flow rate of 10 sccm, the preferred orientation plane is (220) and the coatings deposited with N2 flow rates of 20 and 30 sccm show the (200) preferred orientation. The films thickness decreased from 770 nm to 347 nm upon increasing the nitrogen gas flow rate, and the surface morphology of the coating changes from pyramid-like grains with pores to become dense and smooth. The average roughness, RMS roughness and average grain size decrease with increasing of nitrogen flow rate. The wettability characteristic of the coatings was assessed using contact angle measurements. The results revealed that the Ti/TiN/TiAlN thin layers exhibit hydrophobic behavior. Coating deposited with high N2 flow rate (30 sccm) shows low hydrophobicity

Experimental Investigation of a Solar Hydrogen Production System Through the PEM Electrolyzer

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Abstract: In recent decades the search for novel fuels to replace fossil fuels has increased.

Hydrogen fuel has attracted much attention among these fuels due to its advantages. It can be generated from different raw materials using numerous resources, especially water electrolysis and natural gas reforming. However, water electrolysis integrated with renewable power sources is the cleanest method to produce hydrogen and reduce greenhouse gases. Therefore, this work focused on the experimental analysis of solar hydrogen production through the indirect coupling between photovoltaic panels and PEM electrolyzer via a power management unit. The efficiency of PV and electrolyzer were 11.3% and 38%, respectively, which resulted in a hydrogen volume of 160 liters during the experimental periods. The hydrogen produced was stored in special tanks to convert into electrical energy by fuel cells.

Structural, Stabilities and Energetic properties of Silver clusters: A DFT Study

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Abstract: The study of nanoclusters of different materials has become the topic of research is both physics and chemistry during the last four decades, because of their size-dependent evolution of unique electronic properties and practical applications in many different fields from catalysts to optics. Their unusual physical properties such as structural, electronic, and magnetic are not well understood and they are still the subjects of intense research. An understanding of the formation mechanism of small clusters would help to identify efficient routes to their synthesis and identification. Here, we study the geometrical structures, relative stabilities, and electronic properties of silver clusters (n=2-7) using the first-principles pseudopotential simulated annealing within the generalized gradient approximation (GGA) of density functional theory (DFT) implemented in the SIESTA program. By considering a large number of structures for each cluster size, the lowest-energy isomers are determined. The growth pattern behaviors and relative stabilities are analyzed from the binding energies, second-order difference of energies, and HOMO-LUMO energy gaps. Finally, we discuss the results that we found to be consistent with the results of other work.

Optimization of Hybrid Photovoltaic/Wind Turbine System including Battery Storage

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Abstract: This paper discusses the modeling, design, and optimization of a photovoltaic/wind turbine/batteries system. Tests are carried out in Bejaia (Algeria), where the solar and wind energies are highly exploitable due to their geographical location. The design of the studied system uses the total incident energy approach to define the size of the photovoltaic and wind generators. The different energy sources are connected to the DC bus via converters to enhance the maximization whatever the weather conditions. Three MPPT methods (Perturb & Observ P&O, Incremental Conductance IncCond, and Fuzzy Logic Controller FLC) are used to optimize the PV system strategy. As for the wind turbine, three MPPT methods have been investigated (Optimal torque control (OTC), Gradient Method (GM), and Fuzzy logic controller (FLC). Following power, efficiency, and response time comparisons, the method only with the best performances has been incorporated into the studied system. The simulation is built using Matlab/Simulink. The obtained results are shown and discussed to demonstrate the applicability of the suggested system. Power control is proposed as a method of controlling the water pumping hybrid system.

Structural and optical properties of perovskite nanomaterials

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Abstract: With the fast economic growth accompanied by the large demands of industry activities, scientist this past few years have starts many researches on multiferroic nanomaterials because of its several properties. Bismuth ferrite BiFeO3 has been found to have a ferroelectric phase transition at high Curie temperature (TC =1103 K, BFO becomes the most promising and widely known multiferroic material. In addition to its multiferroic character, nanostructured BFO shows intriguing physio-chemical behavior, such as enhanced photocatalytic and photovoltaic properties that may not be found in the bulk counterpart. The field and temperature dependent magnetization measurements exhibited significant difference between the magnetic properties of the bulk materials and their corresponding nanoparticles. In this work, BiFe(1-x)SnxO3 thin films where x=0, 0.02 and 0.05 , were prepared by a sol gel method and deposited using Spin Coating. The purpose of this work was to see the influence of Sn substitution on structural, microstructural and optical properties of BFO doped Sn. X-ray diffraction pattern confirms the incorporation of Sn2+ ions in BiFeO3 lattice, with small traces of secondary phases of SnO2 and Bi2Fe4O9. It confirms also that pure BiFeO3 thin films have a single-phase rhombohedral symmetry with R-3m space group and shows the development of this structure from R-3m to R3m while doping BiFeO3 with Sn atoms with the different proportions of institutions. The optical properties show that the band gap varied for the BiFeO3 pure from 2.22 to 2.40eV for BFO doped Sn 2%. This material can be used for photocatalytic applications, and photovoltaic applications.

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Hydrogen storage properties of intermetallic-hydrides obtained from firstprinciples calculations

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Abstract: Hydrogen storage is regarded as an effective route for new and renewable energy. Its high energy per mass ratio favors its applications in various fields and advanced technologies. There are two modes for physically storing hydrogen : as a gas under high pressure or as a liquid at cryogenic temperature. Both modes request costly and high energy, which is especially a disadvantage when it comes to a mobile storage. Nevertheless, other ways have been reported namely storing hydrogen within solids. MgXH3 (X=Co,Ni) systems stand as promising materials for solid-state hydrogen storage. The present work deals with the structural, formation energy, elastic properties and stability along with the gravimetric density and desorption temperature of the materials of interest using first-principles calculations. These calculations give a formation energy of -69.55 kJ/mol.H2, -13.25 kJ/mol.H2, respectively for MgCoH3 and MgNiH3. The lattice parameters are found to be respectively 3.30 and 3.35 Å. Besides, the elastic constants C11, C12 and C44 have been determined as well as the bulk modulus and the shear modulus. Furthermore, the gravimetric density is found to be 3.50 wt % and 3.51wt % respectively. The desorption temperature is determined as equal to 532.1 and 101.3K, respectively. The information derived from the present study shows that MgCoH3 could be used efficiently for hydrogen storage applications.

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The electronic and optical properties of double perovskite Ca2MnIrO6

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Abstract: The main objective of this work is to investigate the electronic and optical properties of double perovskite Ca2MnIrO6. The calculations were carried out using the full potential linearized augmented plane wave (FP-LAPW) within density functional theory (DFT) .The exchange-correlation potential is treated within the generalized gradient approximation (GGA), including the spin-orbit coupling(SOC). The structural optimization showed that Ca2MnIrO6 exhibits a monoclinic structure (space group P21/c),with an antiferromagnetic coupling. The absorption coefficient, optical conductivity, and reflectivity are calculated in an attempt to understand the optical response of this double perovskite. The results of GGA and GGA+SO predict the half-metallic characteristics of this material. The strong absorption by this material may suggest the potential application in optoelectronic devices.

A parametric study of a small Darreuis vertical axis wind turbine using Qblade

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Abstract: Wind energy is perceived to have significant promise as a clean and practical source of renewable energy and as a crucial component in lowering harmful carbon dioxide emissions. The two main categories of modern wind turbines are horizontal axis wind turbines and vertical axis wind turbines. In effect, there has been a surge in interest in lift-type vertical axis wind turbines (vawt), especially for both large-scale offshore wind energy production and small-scale urban devices. This type of wind turbine is among the most typically studied vertical axis wind turbines using experimental or numerical approaches. One of the most popular numerical softwars for estimating the aerodynamics of wind turbines is qblade, which was created using the dmst theory and the lifting line free vortex wake approach. In this work, a parametric study for a small vertical axis wind turbine has been conducted using qblade to analyse various values of critical parameters such as efficiency and output power. The most important vawt design parameters impacting the turbine's efficiency have been taken into consideration (such as blade airfoil, blade configuration, number of blades, etc.). The numerical results showed that the dtms method, when compared to earlier cfd and experimental studies, can provide correct results. It is also dependable for optimizing turbine efficiency under various operating conditions.

Hybrid fuzzy sliding mode control of the power generated by wind energy conversion system (WECS) based of a doubly fed induction generator (DFIG

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Abstract: In this work is developed a hybrid algorithm enter two control techniques namely: sliding mode and fuzzy logic to keep instantaneous, independent, accurate and continuous control of active and reactive power generated by WECS based on a DFIG and improve the tracking qualities with zero static error and ensure robustness with a guarantee stability. This allowed obtaining a high efficiency and an optimal production quality. In the first part we presented the individual modeling of the wind chain that is composed of a DFIG driven by a turbine with variable blade pitch to control the energy capture of the wind during its low and high speeds. This machine is coupled directly to the grid through the stator and driven by the rotor magnitudes through two bi-directional PWM converters. The main function of these converters is the connection of the wind generator to the grid in two different ways: one on the grid side converter that will allow the DC bus control and improve the power factor on the grid side; the other on the rotor side converter that will allow the control and optimization of the energy flow generated by the stator of our system. To do this, we will develop the hybrid fuzzy sliding control based on estimated gains and fuzzy controllers to eliminate the phenomenon of chattering the disadvantage of the sliding control, and converge these errors to zero and thus ensure the stability of the system the disadvantage of the fuzzy logic control.

Effects of suprathermal electrons in TNSA regime of laser proton beams acceleration on dosimetry distribution

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Abstract: In this work, we are interested in the high-energy laser plasma acceleration. Bundles of protons accelerated to energy in a range of (60 to 250) MeV, by the TNSA (Target Normal Sheath Acceleration) mechanism in vacuum at the rear face of a solid target (of different materials & thicknesses), irradiated by CPA-laser pulses (10-500 fs of duration, IL=1018-1022W/cm2 of intensity and □L=0.8μm of wavelength). In this regime, an ETNSA electric field due to charge separation is created, eventually, the protons are accelerated by this field in the direction normal to the target. These beams having good characteristics making it possible to ensure an equivalent dosimetric distribution for each case of organ at treat. The question that arises is how to determine a tumor volume, in fact, how we can obtain a good Spread-Out Bragg Peak "SOBP" equivalent to a tumor to be treated according to the TNSA parameters in the presence of suprathermal phenomena. For this, we established a semi-analytic hydrodynamic plasma model with cold ions, assuming suprathermal electrons modelled by a kappa-type distribution. Our study is based on two steps. First, we looked for proton beams energies spectra at the front expansion for different TNSA parameters as laser characteristics and target material in the presence of suprathermal electrons phenomena, using Matlab software. Second, the maximum proton energies, proton numbers and proton beam spots are then injected in the dosimetry simulation using MC-Gate software to obtain a diffused Bragg peak to scan volumetric tumor. The proton energy and spectra at the plasma front acceleration have been characterized as function of electron suprathermality phenomena for different laser and target situation. It is shown that, the number of accelerated protons and the energy cut-off increases with the number of superthermal electrons present in the LPA process under the TNSA regime. We have succeeded in optimizing proton beams according to the proportion of superthermal electrons, where we obtain a quasi-mono-energetic, stable and reproducible proton beams. This allowed us to optimize the distribution of the dose in depth according to the

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A pH-sensitive hydrogel for protein delivery

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Abstract: Hydrogels are interesting materials for pharmaceutical application and are particularly useful as drug delivery systems because they are biocompatible and nontoxic. They consist of three-dimensional, hydrophilic, and polymeric networks capable of absorbing large quantities of water or biological fluids in the presence of hydrophilic groups and releasing the drugs entrapped in them through slow diffusion[1].due to the biodegradability and biocompatibility, the hydrogel biomaterials generated from poly(vinyl alcohol) (PVA) are widely used in the biomedical fields[2]. In this study hydrogels of Polyvinyl alcoho-g-acrylic-2-acrylamido-2-methyl-1-propanesulfonic acid were synthesized by graft copolymerization.BSA was chosen for use as a model protein drug to evaluate the controlled release properties of pH responsive hydrogels synthesized.Swelling behavior in distilled water, in physiological saline and in bovine serum albumin (BSA) solutions was studied. Influence of initial BSA concentration and pH on hydrogel swelling was investigated.Loading of BSA onto the hydrogel was studied using aswelling–diffusion method Release profiles of model protein from drug loaded hydrogel were studied in distilled water at pH 1.2buffer (simulated gastric fluid) and pH 7.4 buffer (simulated intestinal fluid).

Investigation of temperature-dependent electrical properties in Cu2SnS3 by Hall effect measurements

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Abstract: The Cu2SnS3 (CTS) single crystal was prepared by melt growth method heating in the stoichiometric mixture of Cu, Sn and S. The elements were sealed in evacuated quartz ampoules to a pressure about 10-6 Torr. The ampoule was Inserted into a Carbolite tubular furnace. Initially it was heated from room temperature to 1100 °C in three steps with different rates, at a rate of 0.5, 0.5 and 2 °C/h. The molten mixture was kept at this temperature for 24 h. It was later cooled at a rate of 0.5 °C/h up to 1000 °C. The ingots were annealed at this temperature for 12 h. then at 0.5C/h to 600 °C. The cooling rate from 600 to 300 °C was 0.5 °C/h. The furnace was then turned off and the ingot cooled down to room temperature. Electrical parameters were carried out by Hall Effect measurements. The p-type material was observed. At room temperature, carrier concentration (p), conductivity (σ), mobility (□) and bandgap energy were 9.55 x 1014 cm-3, 1.94 x10-1 Ω-1cm-1, 1.27x103 cm2/Vs and 0.92 eV, respectively. Measurements at low temperatures (80 K – 300 K) were carried out. Activation energy and thermal impurity-to-valence band activation energy of 163 meV in range temperature (120 K - 133 K) and 105 meV (230 K – 264 K) were determined from Arrhenius plot of ln (σ) and ln(p) versus 1/T respectively. The observed scattering mechanisms in are attributed to ionized impurities and acoustic phonons at low and high temperatures, respectively.

Investigation of the effect for incorporating an ultrathin Al2O3 BSF layer on the performance of CIGS-based solar cells

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Abstract: The global energy crisis and the greenhouse effect are serious issues that have compelled researchers to study renewable energy technology. Over the last few decades, there has been significant progress in renewable energy research, especially in the solar photovoltaic (PV) field. Various types of solar cells such as silicon, Cadmium Telluride (CdTe), and copper indium gallium arsenide (CIGS). The purpose from the presented work here is to improve the efficiency of such devices by using cheaper materials. Accordingly, a back-surface field (BSF) layer made of low-cost and widely available Aluminum oxide (Al2O3) with a thickness of 0.6µm is introduced into the basic CIGS solar cell using the SCAPS-1D program tool based on CdS as a buffer layer, resulting in the alternative structure of Al/ZnO/CdS/CIGS/Al2O3/Mo with zinc oxide (ZnO) thin film as a buffer layer. One-dimensional simulations of the solar cell capacitance are employed to study the photovoltaic parameters such as the power conversion efficiency (PCE), short-circuit current density, open circuit voltage, fill factor, and quantum efficiency of the devices. The Cu (In, Ga) Se2 absorber layer's thickness varies from 0.1to 2 µm to optimize the device. The proposed structure offers an efficiency of 24.27% (Voc =0.95Volts, Jsc=30.62 mA/cm2, and FF=83.20%) with a thin active layer of only 0.5 µm. In addition to reduced CIGS thickness and cost, the presented approach results in CIGS solar cells with enhanced performance compared with previously reported conventional designs.

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Synthesis of Pt/α-Fe2O3/TiNT heterostructure for enhanced photoelectrochemical water splitting and photocatalytic applications

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Abstract: In this work, we report an efficient and novel strategy to improve the solar energy conversion effeciency of TiO2 nanotubes (TiNT) photoanode by the formation of a heterostructure with Hematite and Platinium nanoparticles (Pt/α-Fe2O3/TiNT) through electrochemical anodization and electrodeposition methods for water splitting and photocatalytic applications. The characterization of Pt/α-Fe2O3/TiNT heterostructure was provided by using scanning electronic microscope (SEM), UV–Vis diffuses reflectance spectroscopy, linear sweep voltammetry (LSV) and electrochemical impedance spectroscopy (EIS). The combined effect of both Pt and α-Fe2O3 on TiNT considerably improved light absorption in the visible spectral, giving rise to the enhancement of both photoelectrochemical and photocatalytic performances. This activity is mainly attributed to the more effective charge separation due to the narrow band gap (2.2 eV) of α-Fe2O3 and to the presence of the localized surface plasmon resonance (LSPR) of Pt NPs.

Key Words: TiO2 nanotubes, Hematite, Platinium nanoparticles, optical absorption, localized surface plasmon resonance, photocatalysis.

A DFT study of the electronic and optical properties of a photovoltaic absorber materials BRb3Pn2 (Pn= P, As)

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Abstract: By using density-functional theory based first-principles calculations, we have systematically investigated the electronic and optical properties of the alkali metal dipnictidoborates BRb3Pn2 (Pn= P, As). Both compounds are predicted to be indirect gap semiconductors of 2.048 eV and 2.242 eV respectively. Moreover, the optical spectra of BRb3Pn2 (Pn= P, As) obtained from the hybrid HSE-06 functional demonstrate strong anisotropy between different light polarizations. Our results reveal that the BRb3Pn2 (Pn= P, As) is an attractive candidate for optoelectronic applications as it is a semiconductor with a indirect band gap, a relatively high carrier mobility, and an onset optical absorption energy in the visible light range. Finally, based on an effective-mass, we find the exciton binding energies are 9.87 meV for BRb3P2 and 8.62 meV for BRb3As2. These values of the order of the thermal energy at room temperature suggest an easily dissociable hole–electron pair. Our studies provide an improved understanding of electronic and optical properties of BRb3Pn2 (Pn= P, As) and might shed light on their potential electronic and optoelectronic applications.

Computational modelling of the thermoelectric properties of Zintl compounds RELi3Sb2 (RE= Y, La)

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Abstract: By performing first-principles DFT calculations combined with the Boltzmann transport equation, we investigated the dynamic stability, electronic structures, and thermoelectric properties of the ternary RELi3Sb2 (RE=Y, La) compounds. Taking advantage of using the modified Becke–Johnson potential (TB-mBJ), the calculated electronic band structure indicates narrow and indirect band-gap characteristics of the studied structures. Within the semi-classical Boltzmann transport approach and the relaxation time approximation, transport properties (The Seebeck coefficient, electrical conductivity, electronic thermal conductivity, and figure of merit) of YLi3Sb2 and LaLi3Sb2 compounds at different temperatures were estimated. High-power factors are produced by the combination of a high Seebeck coefficient and high electrical conductivity. The thermal conductivity in RELi3Sb2 is low as compared to other Zintl thermoelectric materials. The predicted maximum figure of merit (ZT) at 300K of n-type (p-type) are 0.82 (0.80) and 0.86 (0.81) for YLi3Sb2 and LaLi3Sb2, respectively. These findings suggest that the ternary Zintl compounds YLi3Sb2 and LaLi3Sb2 are promising candidates for thermoelectric materials at room temperature.

Optical absorption and visible emission analysis of novel reddish-orange Pr3+ doped antimony-based glasses materials for laser applications

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Abstract: In this article, a novel series of Pr3+-doped Sb2O3-based glasses emitting a reddish-orange light were manufactured via a melt-quenched method, and optical absorption visible (Vis) luminescence, and decay lifetime spectrum traits were explored. Luminescence studies reveal the green-orange-red emission from the fabricate glasses by capturing the visible emission spectrum at 485nm, which indicates exact peaks at 531, 544, 597, 611, 646, 686, 709, and731 nm. The optimal SLWP25glass's bandgap (Eg=2.96), indices refraction (n=2.0491), experimental lifetime (τexp=103.9μs), quantum efficiency (η=84.43%), and rates of nonradiative (WNR=1.49 ms). At the latest, outstanding luminescent exceptional performance is clearly reflected by CIE colour parameters as colour–coordinates (0.617, 0.376), colour purity (98.4 %), as well as correlated colour temperature (CCT=1268 K). These amazing results proved that these glasses are a useful tool for making advanced lighting devices such as photonic devices, lasers, WLEDs, and a variety of other optoelectronic devices.

Adsorption Isotherms of Acid Dye on Activated Carbon from Almond Shells.

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Abstract: The textile industry includes integrated activities of pretreatment, spinning, polymerization, printing, texturing and dyeing. It is considered one of the most water-polluted industries, because the discharge of untreated textile wastewater into the environment damages and deteriorates water quality due to the toxic nature and bio-degradability of these synthetic dyes. In an attempt to eliminate this environmental pollution, many treatments are carried out such as chemical oxidation, coagulation/flocculation, photocatalysis, adsorption, or other biological methods but adsorption by activated carbon has been regarded as one of the most effective technology for the treatment of textile wastewater. This study is based on the valorization of almond shells to produce activated carbon obtained by physicochemical activation using potassium hydroxide as an activating agent, and characterized by: FTIR spectroscopy, moisture content, ash content, iodine number, methylene blue index, and pHZPC. The effect of the initial concentration of the anionic dye, named Bemacid Blue was studied and the adsorption mechanism of BB on the AC was investigated by isothermal adsorption models, Langmuir, Freundlich, and Elovich isotherms and the characteristic parameters of each isotherm were established. The result obtained showed that the Bemacid Blue adsorption by Activated carbon from Almond shells fit well with the Langmuir model (R2= 0.95)

First principle study of structural, electronic and optical properties of the zinc blende mowxse1-x ternary alloy

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Abstract: The present work is devoted to predict the structural, electronic and optical properties of the cubic MoWxSe1-x ternary alloy with their binary compounds MoSe and MoW. The equilibrium properties such as lattice parameter a, bulk modulus B and its first pressure derivative B' of the studied materials were determined by minimizing the total energies versus the volume, the obtained curves of (E-V) are adjusted by the Birch-Murnaghan equation of state (EOS) [1]. Furthermore, the lattice parameter of the zinc-blende MoWxSe1-x ternary alloy exhibits a non linear variation as function of the compositions. This deviation from the Vegard's law is explained by a small lattice mismatch between the ternary alloy and the binary substrates MoSe and MoW. Once the lattice parameter is determined, we have calculated after that the electronic properties like the density of states (DOS) with the bandgap energies of the ternary alloy with their binary compounds. Analyzing the band structure of each material we have observed an overlap between the conduction and the valence bands, this character indicate that the ternary alloys (x=0.25, 0.5 and 0.75) with the binary compounds (x=0.0 and 1.0) are metallic materials. In the last part of this work, we have investigated the optical properties such as the real, imaginary parts of the dielectric function with the refractive indices of the ternary alloys and binary compounds. In this work the calculation were performed using the density functional theory (DFT) within the full potential linearized augmented plane waves (FP-LAPW) method implemented in the WIEN2k code [2, 3, 4].

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Structural, electronic and magnetic of the perovskite CaCrO3: density functional theory

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Abstract: The structural, magnetic, and electronic properties of the cubic peroviskite CaCrO3 (Pm-3m) [1] were examined using ab-initio calculations based on density functional theory (DFT), implemented using the linearized augmented full potential plane-wave method (FP-LAPW) in the software package Wien2K [2]. In this research work, the phase stability of ferromagnetic (FM) and paramagnetic (NM) states were treated using the generalized gradient approximation (GGA-08) and the optimized structure parameters demonstrate the stability of the ferromagnetic state. In addition, the lattice constant a0, bulk modulus B, and its pressure derivative Bp were estimated to be 3.7357Å, 161.04 GPa, and 0.8253, respectively. A good agreement was found between the obtained results and theoretical data reported in the literature. Furthermore, the magnetic moments, band structure, and electronic density of states (DOS) in their ground state were determined in detail and the obtained results manifest a ferromagnetic half-metallic behavior with a energy band gap, thus suggesting that this perovskite compound can be utilized for spintronic applications.

A mathematical model for intermittent microwave drying of materials

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Abstract: Wood is an ecological, biodegradable, light and resistant material and its transformation requires a low energy cost compared to other materials. The use of renewable energies and materials such as wood minimizes the emission of greenhouse gases and limits waste from the petrochemical industry. In this study the process of intermittent microwave drying was studied for sample of wood. Mathematical modeling is essential to understand the physics of this drying process and to optimize the operation conditions. First, using conditions at the surface limits for temperature and humidity, the simultaneous equations of heat and mass transfer were temporarily resolved with Comsol Multiphysics. The distributions of humidity and temperature within the solid have been obtained during the drying process. The mathematical equations used are those from the Fourier and Fick diffusion models of heat transfer. The microwave heating, described by Lambert's law, was accounted as source term on the thermal energy conservation equation. The numerical solution used the finite element method. The values of moisture content and temperature obtained by numerical solution of the model showed good agreement with experimental data. From this, it was observed the presence of three periods in the drying kinetics. The model results showed that the interior temperature was higher than the surface temperature of sample. In additional, the gradients of temperature were reduced due to intermittency of the microwave power. This redistribution of temperature could contribute to the improvement of product quality during drying

Magneto-electronic and thermoelectric properties of V-based Heusler in ferrimagnetic phase

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Abstract: Motivated by the V-based Heusler alloys which are one of the full-Heusler family and in the objective to enrich literature by new materials for thermo-spintronic fields, we have investigated the structural, mechanical, magneto-electronic and thermoelectric properties of Vanadium-based Heusler alloy V2CoGa via the full-potential linearized augmented plane wave (FP-LAPW) method [1,2]. The calculated equilibrium ground states of properties reveal that the compound favor the XA-type configuration with a ferrimagnetic state. The calculated mechanical properties show that the compound satisfied the criteria stability and the elastic moduli indicated that the studied compound was ductile and anisotropic material. Due to the strong d-electron correlations, we have used the GGA+U approach [3,4] to improve the magneto-electronic properties. The magneto-electronic calculation shows a half-metallic behavior with an integer magnetic moment and large band gap in majority spin channel. Finally, the thermoelectric responses were computed to explore the potential of this compound and their analysis results are discussed in detail.

Numerical simulation of a parabolic trough solar collector based on nanofluids

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Abstract: The parabolic trough collector technology (PTC) presents a promising method for the widespread use of solar energy. PTC use parabolic reflectors in order to concentrate the solar radiation into a small focal line, and this reduces heat losses in the collector at high temperature. In the present study, the fluids (water or oil) and fluids with nanoparticles (nanofluids) are considered as heat transfer fluids. A computer program based on one dimensional implicit finite difference method with energy balance approach has been developed to investigate the behavior of PTC under the real climate conditions of Adrar, Algeria. The simulation results reveal that the collector with nanofluids shows superior performance compared to the water or oil heat transfer fluids case. In addition, the PTC with Water/Cu nanofluid is evaluated as the best configuration followed by Water/Al2O3 nanofluid and Water/CuO in decreasing order. In order to confirm the simulation results, experimental work is suggested in future work.

Degradation of diclofenac in water by coupling the Fenton and plasma GAD processes

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Abstract: Our work is designed with the goal applying a combination of tow advanced oxidation processes (AOP's): the Fenton process and non-thermal plasma by Gliding Arc discharge (GAD) to degrade an emerging pollutant of pharmaceutical origin Diclofenac DIC (200 mg.l-1). DIC is among the most commonly detected pharmaceutical in the aquatic environment, the river and surface water [1-2]. This molecule can cause biological anomalies, that is why it becomes urgent to find solutions for their elimination. The degradation and mineralization of the molecule were studied using analytical chromatographic techniques (HPLC) and total organic carbon (TOC) measurement. The treatments were applied separately and then coupled to evaluate the synergy between two processes: (i) the Fenton process resulted in complete removal of the DIC but with a low mineralization of 48.6%; (ii) the GAD process applied at 0.5 mn has given a mineralization rate of 14.2%; (iii) In post-discharge mode, the percentage of mineralization increased as a function of the post-discharge time tTPDR until reaching an almost stable value (≈ 35%). Chromatographic analysis have indicated the persistence of some by-products for all three treatments cases. The coupled process between the GAD plasma and the Fenton process gave a high percentage of mineralization (> 94%) and a complete elimination of DIC so its aromatic intermediates through the post-discharge

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Development and characterization of polycrystalline scintillator nanomaterials.

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Abstract: The work is devoted to the elaboration of the poly crystal Gadolinium oxyorthsilicate Gd2SiO5 (GSO) doped with rare earths Ce3+ and Eu3+ in the form of trivalent ions, which has excellent properties, high luminous efficiency, fast decay time and good radiation hardness. The obtained material was realized the sol-gel method, for different atomic percentages (% XCe), (% YEu) at room temperature. The temperature of calcination of nano powders and the formation of single-phase GSO is estimated at about 1000 ° C and the purity of the GSO phase was studied by X-ray diffraction (XRD) analyses. The morphology of the samples was examined using field emission scanning electron microscopy (FE-SEM) analyses. The study of the optical properties of GSO: (Ce3+, Eu3+) was characterized by PL photoluminescence, receive respectively an intense blue-violet and red asymmetric emission band ranging from 370 nm to 470 nm and from 580 nm to 700 nm with a maximum intensity, attributed to the transition from 5d to 4f.

Design a power Dual-Layer Inductor of a DC-DC Boost Converter for a Photovoltaic Application.

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Abstract: The industry of Electric power components recently knows and fast race in developing and designing low-profile power converters for different sectors such as mobiles, computers, cars and renewable energies. In this work, we present the opted methodology to design a low-profile and integrated power inductor for a DC-DC boost converter for a photovoltaic application. The designed inductor has a volume of [10mm X 10mm X 2.07mm] and operates in a DC-DC boost converter where the input voltage is 17 V and supplies an output voltage of 220 V with an output ripple less than 0.8%. And operating under a frequency of 500 kHz, the maximum current flowing in the inductor is 7 A. The work covered an investigation of the effect of the coil conductor thickness on the inductance value and power losses. Also, the effect of the gap between the layers. The designed model is numerically investigated by the finite element method by solving the maxwell equation in order to illustrate the magnetic flux and the electrical distribution in the inductor for each case. The equivalent circuit of the dual layer inductor is used to validate the good operation of the inductor in the application and also to illustrate the efficiency and output voltage behaviour of transitional regime and flowing current in the inductor for different cases.

A numerical simulation of a new solar cell structure based CIGS and CZTSe absorber layers

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Abstract: This study presents a numerical simulation of a new solar cells structure based CIGS, to improve its electrical performances, we were need to add a new absorber material, a among the most promising quaternary semiconductors used to this improvement of thin film photovoltaic cells is CZTSe, it just a derivate of CIGS material, CZTSe composed with non-toxic, abundant elements and a direct gap. In addition to the low cost, the CZTSe and these assets, represents an excellent candidate to alternate the other materials of chalcogenic elements as the CIGS and CdTe used in thin film photovoltaic cells. CZTSe has been insered and investigated as a second absorber layer in solar cell structure: MgF2/ZnO(Al) / ZnO:i /CdS(n) / CZTSe(p) /CIGS(p)/Mo, MgF2 as antireflection coating layer, CdS as the emitter layer, CIGS: absorber conventional layer and ZnO as a transparent conductor oxide, Mo : molybdenum as a back contact, , the effect of some physical parameters as the thicknesses of each layers have been optimized, the band diagram, carriers concentrations and current density are also investigated here to give a justification for how the performances enhancement occurs and to more understand certain phenomena's happened such as losses and different recombination's in which need a peer understood, The obtained results prove that the performances of the structure are improved by insertion of the second CZTSe, the efficiency increased from 22.4% to 29.22%,These results can help overcome the problem of non abundant and the high processing cost of preparation certain materials, such as indium and gallium used in the production of CIGS solar cells. It is clear that numerical simulation is necessary to evaluate and predict quantitatively the effect of certain assumed input parameters; therefore this study is carried out by the simulator TCAD SILVACO using ATLAS module

Mineralogy and morphology study of dunes sand samples taken from Touggourt region of Algeria southeast

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Abstract: For possible use of the dune sand from southeast Algeria, representative samples were collected from Zaouia El Abidia in Touggourt region, and analyzed by several physicochemical techniques such as particle size, XRD, FTIR and MEB. The grain size distribution of our samples suggests that it ranges from silt to gravel. However, DRX results show the chemical compositions of the dune sand were quartz (SiO2), fewer amounts of gypsum (CaSO4; 2H2O), and a small quantity of calcite (CaCO3) in the sand samples whereas FTIR confirms the presence of these minerals in dunes sand and different mineral matters. The shapes of sand grain samples ranged from rounded to subangular to irregular. These characteristics corroborate the interesting and promising uses of Touggourt sand in the industry and nanotechnology. The X'Pert HighScore program was used in the analysis of XRD data.

Physical properties study of new materials based CZTSSe for photovoltaic applications

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Abstract: Today's thin film photovoltaic technology, including CuInGaSe2 (CIGS) and CdTe, relies on elements that are expensive and rare (In, Ga, Te) and toxic (Cd). Therefore, it is necessary to explore new solar absorbing materials consisting of environmentally friendly elements, cheaper and abundant on the earth's droppings. Among them, Copper-Zinc Tin Sulphide/Selenium Cu2ZnSn(S, Se)4 (CZTSSe) is considered the most suitable replacement for CIGS and CdTe. The subject is to present a study of the physical properties and improve the performance of new materials based CZTSSe for photovoltaic applications .

Synthesis of V2O5 nanoparticles with sol gel method and their application in a degradation process

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Abstract: In this study, V2O5 nanoparticles were synthesized via a sol gel method using vanadyl acetylacetonate as vanadium precursor. The operation conditions for the preparation of stable and active particles were optimized. The particles were characterized by XRD, SEM and FTIR analyses. The results show that the formation of stable particles depended greatly on the molar ratio of nsolvent/nvanadium and calcination temperature. The application of the obtained particles in the photocatalytic degradation of methylene blue showed an excellent efficiency since 95% were removed after 120 min of reaction under UV at 254 nm.

Development and characterization of a mesoporous nanomaterial: Application on antibacterial activity

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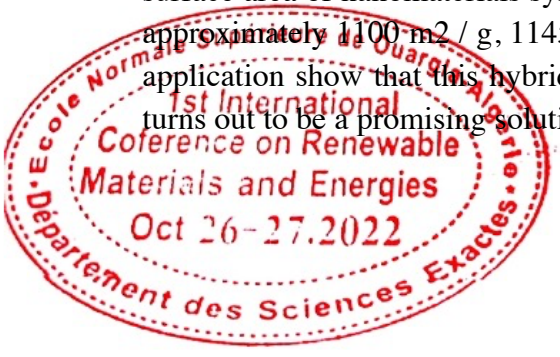
Abstract: This work aims to develop a mesoporous nanomaterial Cu-Si-MCM-41 synthesized from used glass as a source of silica and aluminum by two voies defferents direct and indirect. This elaborate material has been characterized by XRF, DRX, ICP, IR and N2 adsorption-desorption. Characterization by DRX shows that the sample synthesized from used glass has better crystallinity compared to that synthesized from bentonite, this is linked to the aluminum content. The isotherm is type IV according to the classification of the IUPAC. The specific surface area of nanomaterials synthesized from glass waste by the direct and indirect method is approximately 1100 m2 / g, 1145 m2 / g, respectively. The results obtained from the biological application show that this hybrid material based on Cu-Si-MCM-41 as antibacterial inhibitors turns out to be a promising solution in the biological antimicrobial field.



Electronic, optical and elastic properties of CsGeBr3 perovskite

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Abstract: Lead halide perovskite materials of the renowned formula AMX3 have been widely used in photoelectric devices such as photodetectors, solar cells, lasing, LEDs, and memories, due to their excellent characteristics such as a large light absorption coefficient, high carrier mobility and wide band gaps [1-3]. In this study, we propose the perovskite CsGeBr3 crystal in the cubic (space group Pm3m #221) phase. The structural, electronic, optical and elastic properties of CsGeBr3 have been investigated by utilizing the plane-wave pesudopotential (PW-PP) method based on density functional theory (DFT) as implemented in the CASTEP code. The exchange and correlation potential is treated by the generalized-gradient approximation (GGA-PBE). The analytical assessment of electronic properties shows that our compound has a direct bandgap nature. The generalized elastic stability criteria for a cubic crystal are well satisfied, indicating that the CsGeBr3 perovskite is mechanically stable. Our obtained results are in good agreement with both the experimental and the theoretical studies.

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The inorganic wide bandgap n-type materials, such as TiO2 on opto-electronic as electron transport material for perovskites solar cells.

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Abstract: Using the program (CASTEP) which uses a method of pseudo-potential, which is based on density functional theory (DFT), we calculate the properties of the structural, electronic, mechanical and optical of compound TiO2($fluoriteandpyrite$) have used the generalized gradient approximation (GGA-PBE) to calculate the exchange and correlation potential for calculating structural properties (grid constant), electronic properties (band structure and density of states), elastic properties (elastic constants, the elastic modules), And the results obtained agreement experimental and theoretical results available. To understand the properties of materials from a microscopic point of view, we resort to the study of structural properties under normal conditions and under pressure. The application of a hydrostatic pressure hydrostatic pressure to a solid, induces a change of volume and symmetry (phase transition). The phase transition is produced when a phase becomes unstable under given thermodynamic conditions. thermodynamic conditions. The most stable phase corresponds to a minimum energy (G or Hat T=0). During this transition the internal energy will be modified, which means a modification of the equilibrium parameters, such as the lattice parameter. The main objective behind this present research work is to study this compound TiO2 because of the large use as electron transport material for perovskites solar cells in 0 GPa and under pressure from 0 GPa to 50 GPa and study the behavior under pressure and study the properties in 0 GPa and under pressure.

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Artificial Neural Network-Based Control for MPPT DC/DC Converter in Standalone PV System with Improved Performance under Variable Climate Conditions

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Abstract: This paper addresses the efficiency increase of standalone photovoltaic (PV) systems. One of the affecting factors to increase the PV system efficiency is the accurate tracker of maximum power point (MPP). Conventional methods, such as perturb-and observe (P&O) and incremental conductance (INC), are used for maximum power point tracking (MPPT). In this paper, an artificial neural network (ANN) controller for MPPT DC/DC boost converter is designed to maximize the output power of a standalone PV system. The proposed MPPT controller can ensure accurate tracking of the PV module maximum power point (MPP) under varying atmospheric conditions. The adopted ANN structure is a feed-forward multi-layered perception (MLP) neural network trained off-line based on the back propagation algorithm. In addition, this network consists of one hidden layer, where the trial and error method is applied to determine the number of their neurons that provide the optimal neural network with minimum mean square error (MSE). Further, in the learning phase, a part of the database obtained using the mathematical equation, with random values of inputs; temperature, and the irradiation; is used to train the ANN controller. This random choice of inputs allows covering the maximum possible combinations of temperature, and illumination, therefore, offering good training of the proposed ANN controller. Simulation results are presented which demonstrate superior performance of the proposed ANN-based MPPT DC/DC controller in comparison to some reported conventional methods.

Structural, Electronic and magnetic properties of Mn2RuSn Husler alloy under hydrostatic pressure.

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Abstract: The pressure effect on the structural, electronic and magnetic properties of Mn2RuSn Heusler alloy was investigated by first-principles full-potential linearized augmented plane wave (FP-LAPW) method based on density functional theory (DFT). as implemented in the Wien2k code. The exchange and correlation functional has been chosen using generalized gradient approximation (GGA) within the parameterization of perdew-burke-ernzerhof. The lattice constant, the electronic band structure and the density of state (DOS), magnetic properties such as total magnetic moment were obtained under pressure. It was determined that the calculated lattice parameters are in good agreement with the literature. The Mn2RuSn is stable in Hg2CuTi type structure. Furthermore, we expect an extraordinary occurrence pressure-induced metallic ferrimagnetism to half-metallic ferromagnetism transition in the cubic phase of Mn2PdSn alloy at hydrostatic pressures of 40 GPa.

BOR-FDTD study of the diffraction of a radially polarized light beam by rotationally symmetric metallic objects

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Abstract: The spot of arago-poisson is a demonstration of the wave character of the light. It is a bright point of light that appears in the shadow of an opaque disk illuminated by a light wave. This phenomenon has caused difficulties in various high-energy laser applications and has been considered as a nuisance. However, it is now being considered to use the size and shape of the arago spot for various applications such as precise alignment in modern engineering applications or probing aberrations in laser beams using the sensitivity of the spot to beam aberrations. In this work, we have studied this spot by considering the vector character of the incident light. We have shown the appearance of a dark zone in the center of this spot when the incident beam is radially polarized. The study was conducted using a bor-fdtd (for body of revolution fdtd) code, developed within the team, which allows to exploit the revolution symmetry of the studied objects. The obtained results are similar to the experimental and theoretical observations made in [1] and [2] where it was shown that the diffraction pattern of a laguerre-gauss beam by an opaque disk shows the appearance of a dark spot in the center of the usually bright arago-poisson spot

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Electrocatalytic performance of zinc oxide nanostructures electrodeposited on ITO glass substrate for the oxidation of ethanol

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Abstract: The electrocatalytic performance of zinc oxide nanostructures electrodeposited on ITO glass substrate for the ethanol oxidation were studied in alkaline medium. The electrochemical characterizations were performed using cyclic voltammetry (CV) and chronoamperometry techniques. ZnO nanostructures were electrodeposited from a mixture solution of nitrate –chloride at -1 V. X-ray diffraction (XRD) show that the film exhibited a hexagonal wurtzite phase without any impurities. Besides, Atomic Force Microscopy (AFM) and Scanning Electron Microscopy (SEM) analysis reveal the surface morphology of prepared ZnO nanostructures. In addition, Mott-Shottky measurements shows that the ZnO thin films was an n-type semiconductor. Furthermore, UV-Vis allows to calculate the optical bad gap of the gap which equals 3.39 eV due to ZnO nanostructures. Finally, the obtained results show that the electrode reveals excellent electrocatalytic characteristics for ethanol oxidation. This study revealed that zinc oxide thin films are good candidate for application in ethanol sensor and ethanol fuel cells.

Ion imprinting polymer for the development of an electrochemical sensor for the selective detection of cadmium(II) ions

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Abstract: Heavy metal pollution can be toxic to humans and wildlife, so it is very important to develop rapid and sensitive methods to detect them. The present work deals with the development of electrochemical sensors based on polymers with ionic imprints for the detection of trace metal ions, especially cadmium ions, in the aquatic environment. A platinum electrode was modified with poly (3,4-ethylenedioxythiophene), (ii /pedot), by an in situ electropolymerization method with cadmium ions as the fingerprint ion. Solvent extraction of cadmium ions created openings in the polymer matrix corresponding to the properties of the target ion (size, shape, and function). All these phenomena are monitored and characterized by electrochemical methods .cv and swv under the conditions of optimized experience. The modified electrode shows excellent electrochemical performance towards cd2+ in a linear range from 0.5 to 75 μg. L-1, with a very good detection limit (lod), quantification limit and an estimated pressure factor of 0.05 μg. L-1, 0.17 μg. L-1 and 2.78, respectively.

Synthesis of copper with sodium dithionite and its application in the degradation of methylene blue via Fenton process

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Abstract: In materials science green synthesis has gained important attention as next generation for researchers due to its simplicity, cost effectiveness and environmentally friendly methods for the synthesis of metals and metal oxides.

In this study, the synthesis of copper by sodium dithionite was investigated. The operation conditions for the preparation of microparticles were determined. The results show that with the molar ratio of sodium dithionite/copper sulfate equal to 10, temperature of 50°C and magnetic stirring of 250 rpm, the reduction yield reached 98.45%. The synthesized particles were characterized by X-Ray diffraction (XRD) and SEM analyses. The particles were mainly formed by Cu with the presence of CuO and Cu2O. Their utilization as catalysts in Fenton process allowed the degradation of 89.86% of methylene blue after 120 min.

The effect of a phase change material on a building's walls on reducing the electricity consumption

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Abstract: The usage of phase change materials (PCM) in house roofs is critical in energy management, ensuring savings and improving thermal comfort inside the building. Integration of PCM into the structure of the building can potentially increase the thermal inertia of its envelope, which could not only slow down heat transfer rates during peak hours, but also reduce the fluctuations of relatively large indoor temperatures and, above all, improve thermal comfort and reduce energy consumption. The optimization results show that PCMs achieved modest cooling energy savings for buildings in the summer (Abdelkader Sarri and al 2021), especially in a hot dry climate with optimum melting points equal to or close to 26°C, with a significant reduction of indoor temperatures in about 4°C and an annual energy consumption rate decrease of 23.73% per year. The proposed study is based on the simulation of a detached house located at the Applied Research Unit in Renewable Energies (URAER) Ghardaïa which consists of two floors with 6 thermal zones per floor under weather conditions corresponding to the year 2018.

Influence of laser power on microstructure and mechanical proprieties of C45 carbon steel after laser borided treatment.

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Abstract: A laser boriding treatment was carried out on C90 carbon steel in order to study the influence of laser power on microstructure and mechanical proprieties after laser boriding treatment. In this paper three specimens of C45 carbon steel were laser borided using the equipment TRUMPF TLF 2600 Turbo with P=1014, 1140 and 1170W [1]. After laser treatment three zones appeared : remlted zone (MZ) near the top surface of the specimen, heat affected zone (HAZ) below the (MZ) and substrate material, which they were observed clearly with an optical microscope (OM), and scanning electron microscopy (SEM). The microstructure of the remlted zone (MZ) and high affected zone (HAZ) was an eutectic mixture of borides and martensite for the boriding specimen and mixture of martensite and ferrite for re-melting specimen. Microhardness profiles were investigated on cross section along the axis of laser tracks of specimens. The Microhardness tester equipped with Vickers diamond tip was used and the results were presented on profiles according the distance from the surface. Wear test was investigated and the results were presented on diagrams giving the mass loss of specimen and counter specimen, and on profiles giving the factor of mass loss intensity. The results of the microstructure and Microhardness affirm the decrease of the Microhardness and wear resistance with increasing the laser power [2].

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Structural and physical characterization of a new yts-pzt ceramic

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Abstract: PZT ceramics with a perovskite structure of the general formula Pb(ZrTi)O3 are used industrially in new technologies, especially in consumer electronics, due to their excellent dielectric and electromechanical properties. This work aims to synthesize, study the structure and physical characterization of novel PZT ceramic materials with perovskite structure ABO3. Substitutions are made at sites A and B to develop their physical properties. The structure is (1-x) Pb(Zr0.52Ti0.48)O3-xY(Ta1/2Sb1/2)O3 solid solution (referred to as PZT-YTS, where x=0, 0.01, 0.02, 0.03, 0.04 and 0.05) after the classical solid-phase synthesis, the samples were sintered at different temperatures (1100, ,1150, 1180) to find products with denser and better physical quality. Check the phase structure, the corresponding microstructure. X-ray diffraction and Raman analysis showed that all ceramics retained the tetragonal phase structure at room temperature. Scanning electron micrographs of the samples showed a uniform particle size distribution.

Sizing and analysis of a grid-connected PV system using PVsyst software in Ouargla city, Algeria

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Abstract: Among all other incompatible energy sources, solar energy is an unending, unpredictable, and durable energy source. This study simulates the feasibility of installing a grid-connected photovoltaic (PV) system to fulfill the electrical energy needs of a residential house located in Ouargla city, Algeria. PVsyst 6.88 software used as a tool to size and evaluate the performance of the proposed system. The daily energy consumption is about 26.8kWh/day. From the obtained results, the system has an average performance ratio (PR) of 0.807. The energy supplied to the user is 9.78MWh/year, where 6.35MWh/year from sun energy and 3.427MWh/year from grid energy. While, the energy that injected into grid is 4.591MWh/year. Furthermore, the highest losses of the system are due to the temperature of PV field, which was 13.22%. This study will be helpful in sizing and evaluating grid-connected PV systems in other locations by using the same method as described in this paper.

Influence of compositional variation on structural and optical characteristics of CuAlxGa1-xTe2

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Abstract: Nanostructured powders CuAlxGa1-xTe2 (x= 0, 0.2, 0.4 and 0.5) were synthesized by planetary ball milling elemental starting materials. The effects of compositional variation on structural and optical properties of the CuAlxGa1-xTe2 were investigated. X-ray diffraction analysis has shown that all powders were polycrystalline and exhibited a tetragonal chalcopyrite structure with (112) preferential orientation. The lattice parameters are found to decrease with the increase of aluminum content. Then, CuAlxGa1-xTe2 thin films were deposited on glass substrates by vacuum thermal evaporation technique using pre-synthesized powders. From the optical analysis, the absorption coefficients of the films were found to be above 104 cm−1 and the optical band gap of the films is increased from 1.23 to 1.65 eV with increasing Al content, which are near optimum values for photovoltaic applications.

Thermodynamics properties of Hydrogen-like ions in spatially non-uniform magnetic field.

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Abstract: In this work, We solve the Schrödinger equation for a charged particle in the nonuniform and strong magnetic field by using the Nikiforov–Uvarov method, and study its effect on the quantum properties of ions in plasma. We have assumed that the strong magnetic field is a sum of two magnetic fields: one, the most intense, has a toroidal geometry, whereas the other of less intensity (about the third of the first) is poloidal. Regarding the quantum properties, We give analytical expressions for the thermodynamic properties such as mean energy and magnetic susceptibility, and analyze the entropy, free energy and specific heat of this system numerically for a hydrogen-like ion in this nonuniform magnetic field.

Ni/Co(MgAl) Hydrotalcite Derived Catalysts in the Dry Reforming of Methane

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Abstract: In In this work, we have studied the catalytic behavior of hydrotalcite type nanomaterials (NiMgAl-HT, CoMgAl-HT and NiCoMgAl-HT) in dry reforming of methane (DRM, $CH_4+CO_2 \rightarrow 2CO + 2H_2$, $\Delta H298\ K = +247$ k,). This reaction is very important process to reduce greenhouses gases since it uses CH4 and CO2. In addition, it produces syngas (H2, CO) with H2/CO ratio value close to 1 which is necessary for the Fischer-Tropsch and methanol syntheses [1]. The major catalysts used for DRM reaction are Ni-based catalysts due to their availability and low cost, but they show a rapid deactivation by carbon deposition on catalytic surface and/ or sintering Ni metallic active phase. As alternative, the use of nanomaterials with well-defined structure such as hydrotalites (HT) have been investigated. The choose of this is new class of materials is based on their several properties [2-4]: 1)high surface area, 2) very important basic features, 3) good dispersion of metallic phase, 4)formation of small metallic particles especially after reduction, properties required in catalysis field.
The samples were prepared by co-precipitation at pH basic constant (pH =11) then calcined at 450 °C for 6 hours. The mixed-oxides catalysts were characterized by XRD, SAA, FTIR, TGA/DTA, RTP, Raman, SEM and TEM. DRM reaction was investigated in the presence catalysts in 400-700 °C temperature range using a heating ramp 4°C/min.
The characterizations of the solids show the promising properties of hydrotalcite type materials. These results confirm the successful preparation method adopted. The catalytic testing shows that the NiMgAl-HTc was the best catalysts due to the formation of small Ni particles with high dispersion and to the (Ni-Mg) synergetic effects which enhance the catalytic activity and avoid the carbon deposition.

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Effect of Ni toward the optical and transport properties of the spinel solid solution NixCu1-xFe2O4 nanoparticles

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Abstract: The solid solution NixCu1-xFe2O4 (NFCO, x= 0, x=0. 2,.x=1) prepared by sol-gel method after annealing at 800 °C crystallizes in a normal spinel structure. The structural, magnetic, optical, electrochemical and electrical properties were investigated. The formation of the tetragonal phase with a good crystallization quality and stoichiometric content were confirmed by X-ray diffraction(XRD) (= 0 and 0.2) while a transition to cubic symmetry is observed for the other compositions. Magnetic measurements reveal that saturation magnetization value (Ms) increases as the amount of Ni in the structure increases whereas the coercivity decreased. The transport properties are characteristic of n-type behavior where the electrical conductivity decreases up to x = 0.4 and then increases above this value, and is governed by the thermal emission over the inter -crystalline. The optical properties namely the energy gap (Eg), reflection index (n), extinction coefficient (k), dielectric complex (ε), optical conductivity (σopt), dissipation factor (tanδ) and relaxation time (τ) were determined.

Study of n-ZnO/p-CuO thin film Heterojunctions deposition by spray pyrolysis for solar cell applications

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Abstract: In this research n-ZnO, p-NiO and n-ZnO/p-CuO nanocomposite (10 and 20 mol. %) successfully thin films were elaborated by spray pyrolysis method onto glass substrates at 480°C. The obtained samples were characterized by means of the: X-ray diffraction (XRD), Scanning Electron Microscopy (SEM), Atomic Force Microscopy (AFM), UV–Vis spectrophotometry, M-lines spectroscopy and Hall Effect. The XRD patterns have shown the ZnO films crystalline crystallize in a hexagonal wurtzite type structure with a preferential orientation along the axis (002), On the other hand, in nanocomposite it's clearly observed by the decreasing of intensity of (002) intense peak. The SEM and AFM images reveal that the morphology is clearly modified with CuO content. The optical transmission spectroscopy UV-Visible, illustrated an increase of optical band gap from 3.22 to 3.27 eV, proportionally with the concentration of CuO. The optical waveguiding measurements carried out on pure ZnO thin films show single-guided modes behavior (TE0 and TM0). The ZnO thin films exhibit n-type conductivity with a low resistivity and good carrier concentration.

Use of bio-based materials for the design and development of electrochemical sensors for selective detection of non-organic pollution

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Abstract: Recently, many approaches have been explored for the development of a more cost-effective and efficient environmental management system using natural polymers due to their low cost, biodegradability, and abundance of reactive surface groups. Polysaccharides are among these. These biopolymers represent an interesting and attractive alternative source due to their particular structure, physicochemical properties, chemical stability, high reactivity and excellent selectivity towards metal ions. Faced with these challenges, researchers have been engaged for many years in the research and development of technologies that are constantly evolving to reduce the compounds hazardous to the environment and to rationally manage and control water pollution. In this work, we have developed and studied an electrochemical sensor for the detection of heavy metal ions using an electrode modified by a new composite material composed of two biopolymers. The sensor consists of the sensitive part and the transducer, showed a very important electroactivity vis-à-vis the detection of metals (pb2+, cu2+, hg2+, ni2+). The electrochemical characterization of the detection was carried out using cv cyclic voltammetry and swv square wave techniques in acid medium. Under the optimized conditions, the sensor in question demonstrated a high sensitivity and selectivity towards pb2+ compared to other metal ions in a linear range of 1pm to 10 mm and a detection limit of the order of 1pm. This device was effectively applied and showed satisfactory results. In addition, this new receiving part has shown good selectivity, repeatability, reproducibility, and stability. This demonstrates its ability to detect trace heavy metals in the environment.

Design and performance improvement of a piezoelectric energy harvester

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Abstract: Vibration energy harvesting is a rather delicate research subject because the main objective is to make autonomous energy harvesters with components that consume very little energy. They are ideal in applications that need to charge a battery, a super capacitor or directly power remote sensor systems. In our study, we aim to study a piezoelectric bimorph fixed at one end to the vibrating machinery with a standard mass mounted at its other end, allowing the recovery of vibrational energy. In order to achieve high output powers (of the order of mW). First, we identify the source of vibration from a vibrating machine, and a piezoelectric transduction to convert this energy into electrical energy. Thus, the addition of a recover energy extraction circuit is a very important point for better management of usable energy

Functionalized surfaces in high temperature applications

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Abstract: High temperature processes are very demanding in terms of material life due to the combined stresses of corrosion, wear, erosion, impact, and mechanical stresses associated with harsh operating conditions. Plant design and material selection encompass many criteria that need to be carefully considered, such as: mass, volume, temperature, pressure, flexibility of process control, capital and operating costs, maintenance, service life... Usually, the selection of materials is mainly focused on mechanical properties, very often at the expense of corrosion problems due to the cost of high strength materials. This is counterbalanced by the addition of thin coatings or surface engineering to provide the underlying materials with new characteristics such as low wettability, better corrosion protection, insulating capability. Three examples will be presented: i) Dense oxide development for turbine blades: the addition of small controlled amounts of key elements can significantly improve the oxidative growth of the protective alumina scale on TiAl based alloys or even support the densification of oxide based coatings for turbine blades. ii) surface engineering of steels to reduce wettability: structuring of low-grade steels with corrosion resistant steels increases the contact angle from less than 80° (hydrophilic state) to 155° (super-hydrophobic state), which significantly reduces contact and adhesion to/with corrosion agents on the steel surface. iii) Surface modification of flexible materials for insulation: the manufacture of a thin IR-reflective coating on flexible materials opens the way to the manufacture of thin, high-performance insulation systems for power generation and oil and gas applications.This presentation provides an overview of some key recent developments using thin coatings and surface functionalization to improve the performance of high temperature plants / facitlities in harsh environments.

Intelligent energy management of a wind-photovoltaic system with storage battery

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Abstract: A supervisor control for the hybrid power system based on a photovoltaic array, wind system and a battery bank, is developed in this paper. In order to maximize the efficiency of the proposed hybrid system, the fuzzy logic controller (FLC) has been applied. The optimal design of the hybrid system is one of our objectives with a maximum energy transfer then a hybrid system supervision for a good monitoring of the functioning of the production subsystems according to the modes of operation. The simulation results presented are obtained under Matlab / Simulink.

Interatomic potential effect on the mechanical behavior of Fe and V single crystals, at molecular dynamic simulation

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Abstract: In order to get concrete results, it is crucial to select the appropriate interatomic potential; which describes the accurate interaction between atoms; before launching any molecular dynamic simulation. The main objective of our study is to detect the suitable interatomic potential to study the mechanical behavior of iron and vanadium bcc single crystal during Nano-indentation process, via molecular dynamic simulation, using LAMMPS code. For that reason, we have performed and compared the same simulation of Nano-indentation of Fe and V single crystals using the following potentials: -Two potentials developed by Mendelev [1] and Olsson [2]. Which based on the embedded-atom potential EAM method, and valuable for metallic bonding.- The Second nearest-neighbor modified embedded atom method potential for bcc transition metals MEAM Potential proposed by Byeong-Joo Lee et al [3]. The results proved that EAM potential gives reasonable dislocation properties. Whereas, there is only reduced dislocation activity for MEAM- Potential, which is fitted to the phase transition. This outcome is in good agreement with previous studies [4].

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Synthesis and Characterization of La-doped TiO2 Nanoparticles by Sol-Gel (Spin-Coating) Process for Photovoltaic Application

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Abstract: In this study, we were prepared undoped TiO2 and Lanthanum doped TiO2 thin films by Sol-Gel (spin coating) process on to glass substrates with doping percent varied from 0 at% to 9 at% in annealing temperature equal to 500 C°. The influence of La doping on structural, optical and electrical properties of TiO2 was investigated then they were characterized using X-ray diffraction (XRD), Fourier transform infrared spectroscopy (FTIR), UV-Visible spectroscopy, and four points method for electrical measurement. For the series of samples the XRD patterns show that the films is crystallized to anatase phase with preferential orientation along to the plane (101) [4] starting from doping percent 0 at% to 9 at%. The mean grains size decrease from 21.27 nm to 18.41nm which causes the number of grain boundaries to increase, and for this the deformation and the density of dislocations increase, with the rise in the doping percent .The samples are transparent in the visible and opaque in the UV. The transmittance in the visible region varies between 82% and 91%, along the visible range and a gap in the order of 3.67 – 3.75 eV. On the other hand, FTIR spectra confirmed the presence of Ti–O, Ti–O–Ti, O–Ti–O, H–O–H, CO2, C–H and O–H stretching vibration bonds. As well as, the electrical resistivity of the deposited films increases with the increasing the doping percent between 2.73 x 10^{-3} and 54.88 x 10^{-3} (ohm.cm).

Lithium storage performances of Zn doped V2O5/Ni-foam

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Abstract: In this work, Zn doped V2O5 powder (V2O5/Zn) has been prepared by thermal decomposition method followed by annealing at 600 °C for 1 h in air and studied as an electrode for Li ion battery. The V2O5/Zn powder was characterized by scanning electron microscopy (SEM) and Fourier transform infrared spectroscopy (FTIR). Electrochemical and lithium-ion storage performances of V2O5/ Zn deposited into Ni foam (Ni/V2O5/Zn) were investigated cyclic voltammetry (CV), electrochemical impedance spectroscopy (EIS) and galvanostatic charge–discharge tests. The results indicate that Zn doped V2O5 is a promising candidate electrode material for high performance lithium-ion batteries.

Entropy and convection effect on Cu-Al2O3/H2O hybrid nanofluid flow inside a special cavity with moving wall.

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Abstract: This study provides a new cavity shape was filled with an extension hybrid nanofluid under a constant magnetic field. Nanofluids have received attention in recent years due to its importance in various industrial applications especially in the renewable energy field. The nanofluid flow is laminar and incompressible. In this work has the method of the finite elements, the parametric regulation was studied on the water hybrid nanofluid that is packed into the middle of the porous cavity in layers and under the influence of a magnetic field. Through this complex geometry, various thermophysical parameters such as Rayleigh number, Hartmann number and nanoparticle concentration are considered .In addition, many properties related to the porous layer are examined, such as its porosity and the Darcy number , the sliding speed of the roof is estimated at . Calculations are made according to the finite element method. The results of this work are presented in terms of streamlines, isotherms, entropy generation and mean Nusselt numbers. They have demonstrated that increasing the Rayleigh number and Darcy number improves heat transfer in the enclosure.

Experimental investigation of salt water vapor temperature's effect on freshwater production of hybrid desalination system working by solar and geothermal energy

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Abstract: Today, the application of renewable energy in the world is widespread in various fields such as water desalination. This work presents an experimental investigation of a novel green desalination method. The operating principal of the proposed desalination unit is based on evaporation/condensation process using both solar and shallow geothermal energy. By evaporating saline water in, for example, a parabolic trough solar collector and letting the water vapor flow in a buried vertical pipe, freshwater will condensate as the vapor is cooled by the ground. In order to assess the freshwater production capacity of the proposed green process, a lab scale prototype has been developed. Different parameters were measured at different points, such as temperature, humidity and water vapor velocity. The experiment findings reveal that the temperature of salt water vapor produced by the evaporation unit has a highly intriguing influence on the productivity of freshwater.

Device modeling and analysis of lead free CH3NH3SnI3/CdS and CH3NH3SnI3/CdTe heterojunction solar cells with different ETMs

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Abstract: Lead-free perovskite materials have attracted noteworthy interest for photovoltaic as they are free from toxicity and showing promising stability issues unlike lead-based perovskites. In this work, the performance of a double absorber heterojunction for two structures (CH3NH3SnI3/CdS and CH3NH3SnI3/CdTe) based solar cell with TiO2, PCBM and SnO2 as Electron Transport Materials (ETMs), is simulated using SCAPS-1D software and the structure is performed without a hole-transport layer (HTL). The thicknesses, defect density, effect acceptor density of the double absorber layer (CH3NH3SnI3/CdS and CH3NH3SnI3/CdTe) are varied for both configurations with the above mentioned ETMs. After analyzing various solar cell configurations, it is seen that Au/CH3NH3SnI3/CdTe/TiO2/ZnO:Al exhibits optimum performance with a Power Conversion Efficiency (PCE) of 25.02%, an open circuit voltage (Voc) of 0.96 V, a short circuit current density (Jsc) of 29.86 mA/cm2 and Fill Factor (FF) of 87.11%. The study on thermal stability shows that these device configurations are stable at 300 K. The simulations done in this work shows the significant influence of current matching point on the tandem cell performance. All simulations are performed by using performed devices under AM1.5G illumination.

The impact of cobalt doping on structural, microstructural, optical, and magnetic properties of ZnO thin films

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Abstract: We present the detailed experimental results of the structural and magnetic properties of cobalt doped ZnO nanorods, synthesized by ultrasonic spray pyrolysis technique. Where the structural analysis was determined by X ray Diffraction (XRD), It was found that all films had a hexagonal wurtzite structure with an average crystalline scale size 23-25 nm. For the magnetic properties of Zn1−xCoxO thin flms are found to be strongly infuenced by Co doping.

Synthesis and Characterization of Bismuth Oxide by Self-Combustion Method.

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Abstract: Mixed oxides play a decisive and critical role in all technological changes. The methods of preparation, the chemical nature as well as the chemical composition of the cations lead to the variation of the physical properties of these oxides such as the crystallographic structure, the morphology, and the specific area. Bismuth oxide nano powder was successfully synthesized via the self-combustion method without calcination. The oxide powder was prepared from Bi (NO3)3-5H2O precursors, and glycine as fuel. Techniques of X-ray diffraction (XRD), scanning electron microscopy (SEM), and BET analysis were employed to characterize the as-synthesized materials. The XRD results confirm the formation of a pure phase without calcination of Bi2O3 and crystallizes under the tetragonal system. SEM results show that Bi2O3 powders synthesized by self-combustion are a little agglomerated giving almost spherical grain. The specific surface area of BET measurements of this powder is 10.1226 m2/g.

Rotational vibrational energies of the potassium dimer usingthe Feynman path integrals formalism

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Abstract: In this study, we determine the ro-vibrational energies of the k2 molecule using the energy spectrum for the q-deformed hyperbolic scarf potential (dhsp) obtained by the path integral formulation. To do this, we introduce a new appropriate approximation of the centrifugal term. Then, using euler angles and the isomorphism between the pseudo-sphere and the su(1, 1) group, we convert the radial path integral into a maniable one which allows us to obtain the explicit expression of the energy spectrum and the corresponding wave function. Our results are in very good agreement with the experimental data and improve those obtained by recent techniques.

2D numerical simulation of hydrogen-methane premixed flames

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Abstract: Due to the gradual depletion of fossil fuels, the transition to renewable energy seems to be the way to replace the conventional sources. However, the energy produced from renewable sources is linked to fluctuations in primary source and the demande.consequently, the energy produced exceeds the demand during certain periods and creates the surplus energy production [1]. One of the most promising alternatives is hydrogen, which remainsan important solution for storing the surplus energy captured.once stored, this energy source must be exploited. The effective way is to inject this gas into conventional fuel. In this present work, we study the effect of hydrogen enriched methane-air flame. The flames that were studied were produced using a 2d configuration of swirl burner at atmospheric pressure with hydrogen fraction 0 vol% to 40 vol % in the fuel. The equivalence ratio was kept to 0.6. The mesh independence study was performed, four meshes were checked (7789, 13279, 21094 and 35940). The temperature profile and the distribution of was validated with experemental data from literature [2]. The effect of hydrogen addition on tempeerature profile, thermal nitric oxide (no) and co2 formation were investigated. The results show that the addition of hydrogen in turbulent partially premixed methane-air flame introduces changes in the profile of temperature and polluant emissions.

Study of the Structural and Electronic Properties of MgFe2 substitution Using the Density Functional Theory

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Abstract: The pseudo-potentiel method based on density functional theory (DFT) using to study the structural and electronic properties of the MgFe2 substituation in MbB2 superconductor compound. Indeed, it is a useful method to predict the crystal structure of new material. In this study the generalized gradient approximation (GGA) according to the scheme described by Perdew-Burke-Ernzerhof (PBE) and the Local Density Approximation (LDA) according to the scheme described by Ceperly-Alder (CA) are applied. The method is implemented tising the PWSCF program to investigate. The calculation of Partial Density of States (PDOS) hawe achieved important results regarding to the most orbitals contribute in Fermi level. In general the results of both lattice constants and electronic proprieties at zero pressure are found to be in agreement with previous theoretical and experimental results.

Contribution of surface treatments by alkalization and silanization to the reinforcement of composites based on vegetable fibers and poly(3-hydroxybutyrate-co-3-hydroxyvalerate)

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Abstract: Poly(3-hydroxybutyrate-co-3-hydroxyvalerate) (PHBV) is a biopolymer produced by a bacterial species [1]. PHBV is an ideal candidate for several applications such as biomedical, food, etc., due to its various characteristics [2]. However, the fragility and high price of PHBV are two major drawbacks that prevent its large-scale application. Therefore, it seems necessary to improve this biopolymer to make it fully competitive with common polymers. Natural fibers have recently attracted the attention of scientists due to their properties, low cost, low density, renewable and biodegradable [3-4]. The use of plant fibers to reinforce composite materials is justified by the sustainable development that allows the use of local resources. The Diss plant (Ampelodesma mauritanica) is a large grass that is widespread in the Mediterranean regions, in North Africa and in the dry regions from Greece to Spain. This plant was previously used in the realization of ancient houses because of its good mechanical and physical properties. Biocomposites based on PHBV and diss fiber are promising materials, combining high performance and possible degradation at the end of life. In this work, different series of biocomposites based on poly (3- hydroxybutyrate-co-3- hydroxyvalerate) (PHBV) and diss (treated and untreated) were prepared by melt compounding. Surface modification of the fibers was performed using several chemical treatments to improve the interfacial adhesion between the fiber and the matrix. The chemical structure, thermal stability, water absorption capacity as well as the mechanical behavior of the obtained biocomposites were studied and the results were compared to unmodified biocomposites and to pure PHBV biopolymer.

Optimized Entropy of Hybrid (Al2O3-Cu/H2O) Nanofluidic Flow in Cylindrical Chamber under a Parallel Magnetic Field

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Abstract: In a cylindrical cavity, the convection and entropy of the hybrid nanofluid were studied. We have introduced a rectangular fin inside the cylinder; the fin temperature is at Th. The right waving wall is cooled to Tc. The upper and lower walls are insulated. This study involves the induction of a constant magnetic field. The governing equations are resolved by the Galerkin finite element method (GFEM). which is used to treat the controlling equations obtained by giving Rayleigh number values between Ra (103 -106), Hartmann number ratio Ha (0, 25,50 ,100), Darcy ranging between (10-2 -10-5), The porosity ratio is (0,2,0.4,0.6,0.8), and furthermore, the size of the nano particles is (0.02,0.04, 0.06,0.08). This information is crucial for controlling both fluid flow and the heat transfer rate for normal convection. The results of the solution demonstrate that Da influences the entropy and leads to a decrease in the generation of entropy. The Nusselt mean differs in a straight line with the dynamic. The domain of flows through the sublime modes while it acts contrary with the magnetic force. The use of a rectangular fin inside a cylindrical enclosure rather than traditional ones, as well as the evaluation of its optimal dimensions, was novel in this paper. Moreover, the novelty of this study is that it fills a research gap by looking into the effect of the specific shape of the walls of the porous chamber on heat flux.

Frequency shifts of photons emitted by rotating particles and Kerr-Newman black hole parameters

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Abstract: Recently, accumulating evidences have been found concerning the existence of a supermassive black hole at the center of most galaxies, including Sagittarius A*, the black hole hosted at the center of the Milky Way galaxy. However, the supermassive black hole parameters,i.e., its mass M, angular momentum J and charge Q are still not well determined and need moreresearch for its range to be tightened. In our work, we present an approach to deal with thisproblem.Assuming that these black holes type are Kerr-Newman, the most general black hole type, weinvestigate how its three parameters M, J and Q are related, in a relativistic way, to the red/blueshifts of photons emitted by geodesic massive particles (stars, galactic dust and gas) andtraveling along null geodesics to a distant observer. In the Kerr-Newman spacetime, we establish the time-like geodesic equations of massive particles orbiting the black hole in circular stable orbits on the equatorial plane alongside with the null geodesic equations of photons emitted by those particles and moving radially. We then obtain expressions of the black hole parameters M, J and Q in terms of these photons frequency shifts.The Kerr-Newman black hole geometry considered in this work takes into account, only the rotation but also the charge of the black. This generality gives the obtained results more importance and make them applicable for other astrophysical phenomena such as accretion discs of black holes, and active galactic nuclei. Moreover, it makes the obtained results compatible with previous works, as we will show.

Influence of Operational Parameters on the Retention of Basic Fuchsin Dye onto Moringa Oleifera Seeds

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Abstract: The adsorption is the most effective technique widely used to remove pollutants from wastewater. The high cost of adsorbents leads researchers to find other less expensive substitutes such as natural adsorbents, like Moringa Oleifera Seeds (MOS). Adsorption of methylene blue dye onto MOS was investigated previously. In this work, MOS were used in their natural state, without preparation or chemical modification, to study the retention of Basic Fuchsin (BF) dye from aqueous solutions in a batch adsorber at room temperature. The characterization of the material was carried out by both FTIR and SEM-EDX techniques. A series of experiments was carried out in order to study the influence of certain parameters on the yield and the retention capacity of the dye on MOS such as the contact time, the adsorbent mass, the pH and the initial dye concentration. Obtained experimental results show that the retention of BF on MOS is indeed influenced by the variation of pH. Equilibrium is reached during 3 hours at pH of 5 on 1.2 g of materials. The adsorbed quantity increases with the increase of the BF initial concentration. About 42% of BF was reached under these conditions. The pseudo-first order model describes well the adsorption kinetics. The adsorption isotherms of adsorbent/adsorbate systems are satisfactorily described by the Freundlich model which supposes a multilayer adsorption on heterogeneous surfaces. MOS materials are suitable for discoloration of wastewater and can be envisaged for use as alternative adsorbent.

Optimal Allocation of Renewable Distributed Generation Using Artificial Ecosystem-based Optimization Considering Multiple Objectives

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Abstract: A large number of benefits can be reached with the integration of renewable distributed generation (dg) in the distribution network, especially renewable energy sources. These benefits include power losses reduction, network reinforcement, reliability and security improvement. However, unsuitable allocation of dg may lead to a significant impact on the power flow, power losses, voltage profile and system stability. Thus, identifying the optimal location and sizing of dg have been the subject of several studies in which various optimization algorithms have been employed. In this paper, the recently developed artificial ecosystem-based optimization algorithm (aeo) is used to solve the optimal dg allocation problem. The efficiency of the proposed method is demonstrated on ieee 33-bus and ieee 69-bus radial distribution test networks. The simulation results show the superiority of the application of the aeo algorithm compared to other existing algorithms in the literature.

Glass transition temperature via machine learning

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Abstract: Glass transition temperature (Tg) is an important factor in the innovation of new glasses, However calculating the glass transition temperature requires experimental and theoretical efforts which makes the traditional calculation physically expensive and time consuming, in this context we have conducted a machine learning model namely support vector regression (SVR) to predict glasses transition temperatures using their chemical compositions percentage, SVR was trained with 80% and validated with 20% of the available data, the results exhibits a strong relationship between glasses composition and their corresponding Tg with root mean squared error around 20k, motivating that in the future we may be able to estimate glass transition temperature with high accuracy and minimal experimental effort.

Saved energy in habitats by improving the thermal conductivity of concrete slabs

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Abstract: The aim of this study is to improve the thermal efficiency of concrete slabs by introducing a plant material, very available in Algeria. This can contribute to the improvement of internal thermal comfort for buildings in hot areas and this by lower energy consumption. For this, several experiments were carried out at the laboratory, to find the thermal properties of a new innovative building material produced by inserting drinn (Aristida pungens) into a concrete slab. Several mass percentages of drinn relative to the total mass of the concrete slab (0%, 0.4%, 0.8%, 1.2% and 1.6%) were studied to see the effect of the introduced quantity of this plant on the thermal conductivity of concrete. It was concluded that the insertion of drinn in the concrete, decreases considerably the thermal conductivity. The best results are noticed for 8% of Drinn, whose thermal conductivity of the concrete is reduced up to 56.94%. As a result, heat gains and losses, through wall or slab, are significantly reduced, which reduces the energy consumed by air conditioning and heating of homes. In addition, the degree-day method was used to calculate the costs of cooling and heating energy for 58 regions in Algeria. The lowest energy cost is noticed in the DJELFA region, while the highest energy cost is noticed in the BORDJ B.MOKHTAR region.

Effect of building materials and comfort temperature on the energy saving of habitats

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Abstract: The building sector in Algeria is ranked among the first energy consumers. Most of this consumption is due to the air conditioning and heating of homes. To save this energy, it is necessary to choose the nature and the thickness of the materials used in the construction according to the climatic environment in which the building is located. Using the ANSYS FLUENT software (finite volume method), a 10x10x3m habitat prototype was studied. The boundary conditions take into consideration the ambient temperature and the solar radiation of the Ouargla region. They are taken averaged during the hottest months; from May 1st to October 31st. Three types of wall construction materials (brick, concrete and stone) were studied for different temperatures of the interior environment (19, 22, 25 and 28 °C). The results showed a very large difference between the Air-conditioning loads of the different building materials and the different comfort temperatures. The suitable building material is 30cm thick brick. The air conditioning loads are increased compared to the 30cm of brick by 92.15% for stone and 89.05% for concrete of the same thickness. When the thickness of the simulated housing envelope is reduced to 15cm, the cooling loads are increased by up to 97.70% for brick, 104.93% for concrete and 105.15% for stone.

Fabrication of SnO2 gas sensor for volatile organic compounds (VOCs) detection using spray pyrolysis

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Abstract: Ethanol is commonly employed in a wide range of products that come in direct contact with human skin. (e.g., medical products such as hand disinfectants in workplaces, cosmetics such as hairsprays or mouthwashes). In this study thin films of (SnO2) were deposited by using the spray pyrolysis method on porous silicon, silicon ,and glass at 450°C substrate temperature . A gas sensor was fabricated by using the deposited SnO2 thin films to detect ethanol VOCs. Thin films were characterized by X-ray diffraction (XRD), and UV visible spectroscopy. The sensing properties of the films were studied towards VOCs at different temperature values. The results showed that the sensitivity of the film the best or temperature reached about 220°C.

Green synthesized NiO nanoparticles for non-enzymatic glucose sensing

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Abstract: Glucose is an important biomolecule for human body; it is extensively used in food and beverages industry. Recently, glucose sensors have attracted research attention due to their numerous applications, such as medical diagnosis, bioprocess and environment monitoring. The development of accurate, reliable and low cost devices for glucose determination presents one of the important topics in scientific research. In this work, NiO nanoparticles with 20 nm sizes were successfully obtained by a simple green synthesis route using nigella sativa seeds extract and were further used as a modifier on glassy carbon electrode for glucose sensing. They showed good stability, excellent catalytic ability and remarkable sensitivity.

Molecularly imprinted polymer supported on green synthesized rGO@AgNPs for sensitive electrochemical detection of Lactic acid

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Abstract: Using Allium sativum extract, we provide a unique one-step green reduction technique of reduced graphene oxide decorated with silver nanoparticles (rGO-AgNPs) that is both cost-effective and environmentally benign. After that, the rGO-AgNPs were combined with a molecularly imprinted polymer to form a highly sensitive selective electrochemical sensor for detecting lactic acid, a crucial agent in cancer cell screening. SEM, X-ray diffraction and Fourier-transform infrared spectroscopy were employed to investigate the shape and surface properties of the produced nanomaterials. Cyclic voltammetry, on the other hand, was employed to characterize the modified electrodes in the presence of [Fe(CN)6]3-/4-. The electrochemical detection of LA was performed indirectly using AuE/rGO-AgNPs/MIP and was based on the signal generated from [Fe(CN)6]3-/4- redox peaks that steadily decreased with increasing LA concentration due to the interruption of electron transfer paths, indicating high sensitivity towards the target molecule. With a detection limit of 0.726 μM (S/N=3), the current variation I(I BLANK - I LA) was linearly proportional to LA concentrations ranging from 10 to 250 μM. The designed LA sensor demonstrated high selectivity and stability. Moreover, the LA sensor's durability was tested against various pH media, with satisfactory results confirming the possible usage in a variety of real-world samples.

Preparation, development of phases, microstructures and electrical properties of xCement-(1-x)PZT ceramics

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Abstract: The piezoelectric ceramics xCement-(1-x)PZT where x=0, 0.0025, 0.005, 0.0075 and 0.01 were studied using conventional mixed-oxide route and sintered at 1100 °C. The X-ray diffraction analysis confirms thephase formation of PZT perovskite structure. At x=0.005: the dielectric constant and loss of the material are investigated at sintering temperature and found to be 955 and 0.013 respectively. The mechanical quality factor and piezoelectric charge coefficient for 0.005Cement-0.995PZT material are found to be 350 and 125 pC/N respectively. The grain size of the material is studied by using Scanning electron microscopy.

Effect of GdF3 substitution on the structure and electrical properties of Bi1.6-xGdxPb0.4Sr2Ca1Cu2O8F3x superconductors

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Abstract: The purpose of this work is to study the effect of doping with gadolinium fluoride (GdF3) on the structural, microstructural and electrical properties of the superconducting compound based on bismuth Bi1.6-xGdxPb0.4Sr2Ca1Cu2O8F3x (x = 0, 0.02, 0.04 and 0.06). The samples are elaborated by solid state reaction and they are characterized by X-ray diffraction (XRD), scanning electron microscopy (SEM) and resistivity measurements ϱ(T). The refinement of cell parameters is done in orthorhombic system with Bbmb space group. The obtained results revealed that all the samples are composed of only Bi-2212, Bi-2201 and Ca2PbO4 phases and the highest proportion of the dominate phase which is Bi-2212 is observed for x = 0.02 and is about 91.72% as well. We noticed the decrease of parameter c with increasing GdF3 doping. This behavior can be explained by the difference in the ionic radius of Bi3+ (1.03 Å) and O2- (1.35 Å) substituted by Gd3+ (0.938 Å) and F- (1.285 Å), respectively. From SEM analysis, it is clearly shown that the doped samples are become more connect than the undoped one. Then, the good purity of all samples is confirmed by the energy dispersive spectroscopy (EDS) analysis. The variation of resistivity as a function of temperature shows that all the samples exhibit a single superconducting transition. The onset (Tc.on) and offset (Tc.off) critical transition temperature are increased with increasing GdF3 amount and both of them are reached the maximum values for the sample x = 0.06 of about 80.74 and 76.36 K. This enhancement can be due to an increase of the charges carrier concentration in the CuO2 planes. It is also found that the activation energy (U0) is improved with gadolinium fluoride doping and the residual resistivity (ϱ0) too.

Synthesis and Characterization of a Novel Organic-Inorganic nano-Hybrid: A new prospective material for Electrochemical sensing.

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Abstract: By using in-situ one-step chemical oxidative polymerization, a novel organic-inorganic nanohybrid of polyaniline doped copper oxide nanoparticles (CuO@PANI) was prepared. The influence of the synthetic approach, the doping effectiveness of copper oxide NPs, as well as the nanostructure of the as-synthesized nano-hybrid, were all studied. CuO@PANI nanohybrid was characterized by Fourier transform infrared spectroscopy (FT-IR) , field emission scanning electron microscopy (SEM), X-ray diffraction (DRX) and X-ray fluorescence (XFR). The results showed favorable interaction between PANI and CuO NPs. The electron microscopy analysis of nano-hybrid indicates that CuO is well dispersed and agglomerated in the PANI matrix as can be seen clearly in X-ray fluorescence analysis. Moreover, X-ray assessment indicated that the amount of CuO NPs strengthens the crystallinity of PANI. In the other hand, FT-IR spectroscopy has confirmed the interactions of the hydroxyl group of CuO with the quinoid ring of PANI in addition to metal vibration bands confirming the formation of highly pure CuO nanoparticles on the surface of PANI nanofibers. Moreover, for the electro-responsive behavior study, the composite was dispersed in ethanol (3 mg/ml), and its electrocatalytic activity was examined via a potentiostate in presence of catechol. As a result, the electrical conductivity of the synthesized hybrid was found to be drastically increased (around 60 %) as compared to that of pure PANI at room temperature due to the formation of conducting path between CuO and PANI surface. Hence, through this work we highly recommend to use this hybrid for future sensing applications.

Effect of electron beam irradiation on the properties and ecotoxicity of PHBV/PLA/C30B nanocomposites for food packaging applications

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Abstract: Food packaging manufacturers have become increasingly aware of customer demands relating to concerns about food quality, safety, and most importantly of environmental sustainability. Aseptic food packaging material is therefore essential to preserve food quality over time. For biodegradable packaging, these materials have to be sterilized or decontaminated prior to use to protect against possible microbial contamination. Since our knowledge about polyhydroxyalkanoates (PHA) for food packaging is rather limited, the challenge is to produce biodegradable primary packaging materials which remain stable without affecting mechanical and barrier properties as well as not resulting in toxicological side-effects during both storage and usage. Several methods for decontamination are well documented in literature and these include mainly, hydrogen peroxide (H2O2) technology, wet steam, UV- light and ionizing radiation. Ionizing radiation is an effective technology for sterilization as well as for other and systems, applications such as food pasteurization and environmental remediation. Recent advances in electron-beam technology (eBeam) have made this mode of sterilization a worthy competitor to the traditional gamma processing. In the present work, the objective was to investigate how the radiation stability of PHBV/PLA blends in presence of C30B is affected by eBeam irradiation at absorbed doses of 1 and 10 kGy. The changes induced in terms of chemical structure, morphology, molar mass, thermal, mechanical and barrier properties as well as ecotoxicity were evaluated by several techniques for each absorbed dose.

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Abstract: In this work, the first part is devoted to the preparation of polylactide (PLA) / Cloisite 30B nanobiocomposites by melt intercalation and the characterization of the main properties as a function of the nanocharge contents. The results indicate that the PLA/C30B nanobiocomposites exhibit a mixed intercalated-exfoliated morphology. All the prepared samples showed an improvement in both thermal and mechanical properties in the presence of the nanofiller. The second part is about the biodegradation of PLA and PLA/C30B nanobiocomposites which was carried out by respirometry in compost at 59°C during 80 days. The results indicate that the rate of biodegradation of PLA increases progressively with the mineral filler content, which seems to play a catalytic role on the biodegradability of PLA matrix.

Investigation of Nondestructive Testing Methods for linear Friction Welding steel and aluminum

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Abstract: The Friction welding is classified as a welding process in solid state. It has many advantages related to other welding processes. It is also and applied in many fields (petroleum industry, automotive, aviation and space, etc.). The aim of this paper is to examine and study welding in its solid state especially friction welding between two A 60 steal pieces. We tested the effects of the settings such as rotation speed and time of friction, we used several analytical methods which are simple, but effective and appropriate for this kind of research such as mechanical experiments like stressing test and we have also used non-destructive control such as the visual inspection, liquid penetration test and radiography (γ). This is for detecting the defects in each sample, and to know the impact of the posed conditions (rotation speed and time of friction) . We noted that the increase in rotational speed has reduced defects of welded joint with increasing time of friction. Finally, we noticed that the secret -Optimum welding turnover is steel or aluminum 2000 RPM.

Physico-Mechanical Properties of Diss Fiber Reinforced Composites: A Comparative Study

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Abstract: Polyhydroxyalkanoates are semi-crystalline, biobased and biodegradable polyesters that exhibit a wide range of physical and mechanical properties depending on their composition. However, its production cost, which is much higher than that of conventional plastics, their low impact resistance and low thermal stability limits the large-scale application of PHA. Several methods have been developed to improve the properties of this biopolymer, such as copolymerization, chemical modification or the incorporation of numerous fillers, which modulate both the biodegradation and the mechanical properties of the final products. Natural fibers are now a widely studied choice for composite manufacturing applications and are increasingly replacing synthetic fibers . Therefore, the aim of this work is to investigate the effect of natural fibers, which are extracted from the Diss plant, on the physico-mechanical proprieties of PHBV matrix based biocomposites. The results are compared to those of PP-based composites reinforced with the same fibers. Diss fibers were subjected to alkaline treatment to improve interactions at the polymer/fiber interfaces. The results of the mechanical tests reveal an improvement in the Young's modulus of PHBV after the addition of 20% of treated Diss fibers. However, this improvement is accompanied by a decrease in impact strength due to phase discontinuity and increasing stiffness. The obtained biocomposites show similar mechanical properties compared to those obtained with PP-based composites.

Keywords: Natural fibers, biocomposites, PP, mechanical properties, Alkali treatement

Impact of different culture conditions on bioenergetic potential of native microalgae Selenastrum sp.

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Abstract: Currently, microalgal biomass is receiving wide interest as renewable and environmental-friendly energy feedstock as a rebuttal to chemical stuff and fossil source depletion. These photosynthetic microorganisms are capable of naturally producing lipids that can be used for biodiesel generation. In the present study, the lipid content and fatty acid profile of a native microalgae strain Selenastrum sp. was explored under different culture conditions in context to determine the most suitable for biodiesel production. In total five nutritional and environmental monitoring procedures were done for 10 days, these included high light (35 W m − 2) and high salinity (25 g L − 1 NaCl) exposures, nitrogen deprivation, mixotrophic cultivation (by 2 g L − 1 glucose addition) and natural sunlight culture referred to control. Almost, mixotrophic cultures were the most performant in terms of biomass production (1.35 g L−1) and specific growth rate (0.71 d−1). The gravimetric quantification of total lipids revealed highest contents in nitrogen deprivation and high light cultivations (36.59% and 36.47% dw, respectively), followed by mixotrophic (31.45%), high salt (30.79%) and the control (23.82%). As determined by GC-MS, the lipidic fraction was dominated by monounsaturated fatty acids (mainly C18:1) in high light (52.57%), high salt (52.06%) and mixotrophic (37.33%) cultures, while polyunsaturated fatty acids (in the form of C18:2 and C18:3) were the most relevant in the case of nitrogen free and control cultivations. Thereby, this study appoints Selenastrum sp. as promising candidate for improved qualitative biodiesel production mainly under culture circumstances with significant MUFA content.

Keywords: Selenastrum sp., culture monitoring, lipids, monounsaturated fatty acids, biodiesel

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Poster communications

Vibration control by piezoelectric materials of wind blades

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Abstract: Wind energy as one of the most essential current renewable energies in generating new electric power in view of the fact that its benefits. The size of multi-megawatt wind turbines is increasing and the blades became more large due to extract more wind resources, thus the blades are becoming more flexible and hence are susceptible to vibrations induced by external wind loading and tower interactions. This uncontrolled vibration lead to the structural fatigue damage and a notable reduction in the operational efficiency and lifetime of the wind turbine. Therefore, it becomes a necessary to implement systems to control the induced vibrations on the blades. In this work, piezoelectric materials (sensor and actuator) are integrated into the blade structure to reduce vibration

Optical and electrical properties of Sn-TiO_2 thin films

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Abstract: TiO2 thin films have been extensively studied because of their interesting optical, electrical and chemical properties [1, 2]. In recent past, there is much attention in the technology of titanium dioxide thin films owing to its vast applications in optoelectronic devices [3, 6]. In this work, we elaborated and we studied the properties of titanium dioxide pure and tin-doped thin films (Sn-TiO2) with different concentrations. The thin layers were deposited on glass substrates by Sol-Gel spin-coating technique. Later, the thin films were analyzed by XRD, UV-Visible and 4-Point techniques. XRD spectra show good crystallization of the different samples and the presence of the single anatase phase. The UV-Visible results shows high transmittance in the visible region of the thin films between 75 and 95% and the optical gap is large and between 3.4 and 3.7 eV. Regarding the electrical properties, we observe that the resistivity is low (the order of 10-2 Ω • Cm) with a minimum for the sample doped at 3% tin, where it reaches the value of 4.29 (Ω. cm).

Adaptation of SODART code for simulation of sodium heat pipes

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Abstract: The heat pipe is one of the most inventions in thermal physics during the last century because of its unique ability to transfer heat over large distances with minimal losses. Its principle is transport heat from one area to another via a passive mechanism by evaporating and condensing a working fluid. These devices are used in cooling in different domains from processors to nuclear reactors. The primary cooling system of most micro reactors (vSMR) designed to be a heat pipe. Additionally, some solar power plants (SPP) use heat pipes in the thermal collectors as well as in the storage systems. The goal of our project is to find the best way to hybridize a nuclear reactor and an SPP with a thermal storage system. In the study of heat transfer between parts of the hybrid system, we need a special tool that allows the design and analysis of this type of devices. In our establishment we do not have a numerical tool for calculating heat pipes, so we found this solution to take an old code and renew it. In this work we recompile the SODART code to simulate a stainless steel heat pipe running on Sodium with a non-condensable gas. We used the algorithm and the data available in the references to rewrite the code and validate it. The results were very encouraging, all the variables that were calculated using the renewed program were completely identical to the original results calculated using the original code.

Synthesis and characterization of nanozeolites Cu-FAU, Cu-MOR and their composites for antimicrobial properties

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Abstract: In this work, we were interested in the first place in the synthesis of structural type zeolites (MOR, FAU) the different analysis techniques characterized these materials, and on the other hand in the applications in the field of microbiology, this microporous material has known growing interest because of its multiple applications in several fields, including microbiology because of clinical interest against antibiotic-resistant bacteria. Our work consists in synthesizing metallo silicates of FAU [1] and MOR (M = Cu, Zn) in a hydrothermal way. The incorporated zeolites obtained are characterized by different analysis techniques (XRD ,UV-Vis and FTIR) and applied as antimicrobial agents against E. coli and Staphylococcus aureus. Test results indicate that copper and zinc have an excellent ability to inhibit bacterial growth.

Electrodeposition of NiCoO on carbon felt for high performance supercapacitor electrode

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Abstract: Lately, energy storage devices have drawn considerable attention due to growing energy consumption. Supercapacitors are emerging as one of the promising energy devices for future energy technology. They're famous with significant energy density, long life cycles, and the ability to accumulate and deliver energy within a short time.[1] In this regards, carbon-based electrodes such as carbon textile, carbon cloth, carbon tissues and carbon felt are the most used electrodes for its outstanding features namely: electric conductivity, large surface area, remarkable lightweight, flexibility, low-cost and chemical stability which are suitable to be used in an extended domain ranging from micro-electronics to large industrial areas and energy management sectors.[2] However, there are some drawbacks regarding a low capacitance, self-discharge, high cost and low energy density.[3] In order to obtain a storage device capable of providing high energy density and power energy at the same time, we developed supercapacitors based on carbon felt decorated with NiCoO. Herein, NiCoO was electrodeposited on carbon felt to be examined as an electrode for supercapacitor

Prediction of hybrid system (photovoltaic - wind turbine) power based on climatic data using ANN technique .

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Abstract: Renewable energy sources modeling are straightforward correlated to climate data. In order to evaluate the future power extract from hybrid system that combine both photovoltaic and wind turbine sources we shed light forecast of meteorological parameters based on artificial neural network (ANN). To swipe up power energy, several elements such as temperature, irradiation, wind speed air pressure, humidity and air density were depicted, then neural network architecture was achieved to predict the power energy of the hybrid system for future years not seems in the training database. The effectiveness of the proposed technique is tested by employing real climatic data for Djanet town located in Algerian desert. The results obtained show that ANN present high accurate forecasting power energy, therefore the system will behave reliable and the grid remains more stable, indeed the intermittent of renewable sources have been correctly controlled. The proposed study revealed also the importance of renewable energy mainely solar and wind sources deposits potential in algerian desert which can be exploited for a variety of uses, including generating electricity, providing light or a comfortable indoor environment, and heating water for domestic, commercial or industrial purposes.

Electronic transport properties in symmetrical binary (BN) Cx armchair heteronanotubes

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Abstract: We study the electronic transport properties in the (BN) Cx armchair heteronanotubes with binary supercells. The binary supercell consists on duplicating the single (BN) Cx supercell twice equivalently as a double period structure but with discernible BN-C patterns. We consider four kinds of binary (BN) Cx supercell, according to the orientation of the BN armchair cells in both longitudinal and circular directions of the armchair heteronanotubes. The binary (BN)Cx armchair nanotube can behave either as semi-conductor or as metal according to its corresponding supercell. Combining the electronic band structure of the binary (BN) Cx heteronanotube with the electronic transmission coefficient profile of the corresponding unit supercell - when it is incorporated as the device element between two perfect leads of carbon armchair nanotube, - we report three universal types for the electronic transport behaviors, evolving as a selecting rule when x, i.e. the number cells of the armchair carbon nanotube, increases inside the corresponding binary supercell. Energetic stability parameters are also checked into account in order to identify the stability preference that corresponds to the different circular orientation phases in each perpendicular configuration. All the calculations are performed on the basis of the density functional tight binding model as implemented in the DFTB+ software package.

The effect of Heat Treatment on the Microstructure and Mechanical Properties of NiCrBSiFe-WC Hardfacing

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Abstract: In this work, an experimental investigation is carried out to study the impact of heat treatment on the microstructure and mechanical performance of NiCrBSiFe-WC coating obtained by hardfacing on a carbon steel substrate. The obtained coatings were analyzed by optical microscopy, scanning electron microscopy (SEM) coupled with energy dispersive X-ray spectroscopy (EDS), X-ray diffraction analysis (XRD) and Micro-hardness tests. The results show that the cohesion of the coating is probably deteriorated under the effect of heat treatment causes a metallurgical decohesion of the NiCrBSiFe-WC coating, in addition the microstructure contains porosities and microcracks. SEM analysis indicates the formation of CrNiW new phases under the effect of heat treatment and the existence of these phases is confirmed by XRD analyses. Moreover, the decomposition of WC grains makes the hardness of the coating higher than that of the unheated sample. The microhardness of the NiCrBSiFe matrix increases from 640 to 750 HV due to the decomposition of the WC grains under the effect of heat treatment.

Study of the conjugate heat transfer in the receiver tube of parabolic trough solar collector

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Abstract: In this work a three-dimensional numerical simulation of the conjugate heat transfer in absorber of parabolic trough solar concentrator type LS2 has been performed by ANSYS FLUENT 19.1 academic version. The distribution of the solar energy flux on the outer wall of the absorber tube tube is not-uniform, its results are retrieved from the literature HE et al. and they are integrated into the fluent software in the form of a program in C++ language with success. The heat transfer fluid used is Syltherm 800 liquid oil and the LS2 parabolic solar collector from the experimental test by Dudley et al. The numerical results are compared with the experimental data and good agreement is obtained, proving that the proposed numerical model is feasible.

Thermal and optical properties of Sb2O3-PbO-MoO glasses

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Abstract: Heavy metal oxide (HMO) glasses have recently had high research activities due to their good physical and chemical properties. They possess: low phonon energy, refractive index higher than traditional glasses like borosilicate and phosphate glasses, and a chemical durability better than fluoride glasses. Further, they are transparent in near, middle infrared, and visible spectra, which puts them at the first-choice materials for photonics, optoelectronics, sensors, and nonlinear optical devices. New ternary glasses with composition of (90-x)Sb2O3-xPbO–10MoO, for x = 10, 20, and 30 mol%, have been prepared by a melt quenching method. The absorption spectra in the UV-VIS region have been recorded. A good stability against devitrification has been confirmed by differential scanning calorimetry (DSC). The glasses density measurement exhibits density increases with rising of the PbO content in the glass.

Synthesis, Spectroscopic and electrochemical properties of a tetradentate diazomethine iron complex. The single crystal of (FeClL) DMSO

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Abstract: The interaction of metal complex containing ligands with N and O donor atoms has been thoroughly considered [1-2]. Iron complexes have attracted great attention of scientists, due to their structural diversities and potential applications in molecular magnetism and their ability to store and transport dioxygen in hydrocarbons oxidation catalysis [3-4]. In the present work, we report the template synthesis, of a new iron(III) complex FeClL with tetradentate ligand iron prepared following a reported method [5] by refluxing 2-hydroxy-1-naphthaldehyde and 1,5-diaminopentane. The characterization and the identification of the two structures were carried out by Micronalysis, FTIR, UV-Vis, 1H, 13C and DEPT NMR spectroscopy. The molecular structure of the ligand was determined by single crystal X-ray diffraction technique. Electrochemical properties of the iron complex were investigated in DMF by cyclic voltammetry using glassy carbon as working electrode (GC) under nitrogen and oxygen atmosphere. The aims of this study is to mimic oxidation reaction of organic substrates.

Electronic Properties of Yttrium Aluminium Nitride (YxAl1□XN) Alloys: A First-Principles Study

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Abstract: Accurate knowledge of electronic structure of the wurtzite YxAl1-xN materials is requisite for understanding their importance applications in optical and photonic devices. The newly developed modified Beck-Johnson of Koller-Tran-Blaha {nKTB□mBJ} within FP□LAPW method is used to explore the electronic structure, i.e. band structure and electronic density for wurtzite YxAl1□xN compounds for concentrations x= 0, 0.062, 0.125, 0.25 and 0.375. We have found a direct band gap for AlN about 6.10 eV. An indirect band gap have been showen for x = 0.0625, 0.125 and 0.25 about 5.13, 4.97 and 4.50 eV, respectively. A direct band gap equal to 4.17 eV for x= 0.375. Our results indicate that YAlN exhibit gap transitions from direct (Γ→Γ) to indirect (M→Γ) character at (x= 0.0625; Eg= 5.13 eV), and from indirect (M→Γ) to direct (Γ→Γ) at (x= 0.375; Eg= 4.17 Ev). With the replacement of Al with Y, not only the transition of bandgap occurs from direct to indirect and also decrease the bandgap of the understudy compounds. The results obtained is much better than the others works and make this material desirable for many electronic and optical devices.

Valorization of olive oil by-products as valuable source for development and characterization of biopolymer thin film

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Abstract: In the past decades, as alternative to the petroleum based products, biodegradable polymers, such as chitosan, have undergone extensive investigation in order to minimize waste disposal problem. Yet, biopolymers face some constraints, namely regarding their poor mechanical and barrier properties. Hence, this work aim to develop and characterize chitosan edible film incorporated with polyphenols from oil by-products and analyze the effect of polyphenols on mechanical properties properties of the resulting biopolymers. Following the principles of analytical chemistry valuable compounds from food by-products has been extracted and quantified. Furthermore, biodegradable active films containin 0.1%, 0.2% of phenolic extract were successfully developed where mechanical properties were slightly changed improving the tensile strength of chitosan from 13±2.8 mpa to 29% ±2.4 mpa upon increasing. Our results suggest the potential effect of extract for prepared films, these novel materials can be used by the food packaging industry as an active packaging material

Fuel Cell / Micro-Turbine Hybrid Micro Grid Reliability Optimization

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Abstract: In energy systems, reliability analysis, modeling and optimization of complex systems are very important. Although the works on reliability optimization with the traditional method are numerous, researchers are still studying more efficient and accurate methods to solve the redundancy allocation problem. An optimal electric power management strategy is proposed for the operation of a hybrid microgrid system with different types of productions. To approve the maximization of reliability based on the lifetime of the system, which include the investment, operating and maintenance costs, as well as the interest rate and the inflation coefficient. The constraints are the total annual cost (TAC) of the hybrid microgrid consisting of gas turbines, fuel cell, substations and power lines. In order to optimize the electrical generation-transmission system, the bat algorithm (BA) is used. The estimation of the system reliability is solved with the Ushakov algorithm (UMGF). Components may have a total failure, which reduces the performance rate of the components. The results show that the proposed method achieves an optimal design in a reasonable time. We note that, to obtain maximum reliability, we must invest more, and therefore increase the various costs of the system. According to the Kyoto Protocol, concerning global warming, the minimization of greenhouse gases is taken into account in this study.

Entropy and Galerkin finite element study for mixed convection (MWCNT-Fe2O3/H2O) hybrid-nanofluidic flow in a special cavity adopting to the Darcy–Furchheimer model.

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Abstract: In this study, a new cavity shape was filled with an extension (MWCNT-Fe2O3/H2O) nanofluid under a constant magnetic field. The nanofluid flow is laminar and incompressible, while the inertial effect of advection in the porous layer is taken into account by adopting the Darcy–Furchheimer model. The problem is explained in the dimensionless form of the governing equations and is solved by the finite element method. Through this complex geometry, various thermo physical parameters such as Rayleigh number, [102≤Ra≤105] Hartmann number [0≤Ha≤100]and nanoparticles concentration are considered [0.02≤ϕ≤0.08]. In addition, many properties related to the porous layer are examined, such as its porosity and the [0.2≤ ε ≤0.8]Darcy number[10-5 ≤ Da ≤10-2], which indicates the permeability of the porous medium. The content of the hybrid Nano-fluid is considered to be Newtonian, stable and incompressible and in accordance with a constant Prandtl number for the base fluid (Pr = 6.2). Calculations are made according to the finite element method. The results of this work are presented in terms of rheology, isotherms, entropy generation and mean Nusselt numbers. They have demonstrated that increasing the Rayleigh number and Darcy number improves heat transfer in the enclosure.

Artificial neural network based direct power control strategy applied to doubly fed induction generator-based wind turbine

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Abstract: Artificial neural network is an exciting branch of artificial intelligence (AI). Inspired by the concept of biological neural networks, they represent a broad field of research that addresses challenges of perception, memory, learning, and reasoning. These techniques have obtained significant use in the fields of power electronics and electrical machine control because they seamlessly integrate into the control strategies from which they were developed. This paper presents the integration of neural network in the direct power control strategy applied to DFIG based wind turbine, in this study the hysteresis controllers and the look-up table are replaced by a multilayer perceptron using the Levenberg-Marquardt algorithm. The artificial neural network-direct power control (ANN-DPC) is tested using MATLAB/Simulink, the obtained findings have confirmed the efficiency and the robustness of the proposed control strategy on the term of decoupled reactive and active powers.

Study Of Structural, Dynamics And Thermodynamics Properties For The Semiconductors Compounds Libex(As, Sb And Bi)

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Abstract: In this work we carried out a detailed study structural, dynamics and thermodynamics properties for the semiconductors of Nowotny and Juza compounds LiBeX(As, Sb, Bi). The method used in the calculations is the pseudopotential (PP) within the framework of the density functional theory (DFT) as well as the quasi-harmonic approximation by Debye. The study of phase transition under the effect of pressure for LiBeX compounds (X = As, Sb and Bi) is calculated by calculating the energy as a function of volume for five candidate structures. Our results show that the structural parameters calculated with the generalized gradient approximation GGA is in good agreement with the available experimental and theoretical results. Under the effect of pressure the studied ternary compounds undergo phase transitions. The elastic properties are calculated using the perturbative density functional theory (DFPT). Our result show that the values of the elastic constants obey the mechanical conditions of Born stability, thus indicating the stability mechanics of the materials studied. Then, we studied the thermodynamic properties by applying the quasi-harmonic Debye approximation. We presented and discussed the results obtained concerning the change in volume V, heat capacity at constant volume CV, heat capacity at constant pressure CP, coefficient of thermal expansion α, the Debye temperature θD and the compressibility modulus B0 as a function of the temperature for different pressures.

Use of solar energy for photocatalytic water treatment

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Abstract: Water pollution and the energy crisis are two major global challenges in this century. The use of solar energy in the field of water treatment is a potential sustainable solution to the world's water scarcity issue. In recent years, significant efforts have been devoted to developing innovative solar-based water treatment technologies. Among these technologies is solar photocatalysis for degradation of toxic organic pollutants. The principle of this technology is based on the excitation of a semiconductor (generally titanium dioxide TiO2) by the solar radiation which leads to the generation of highly oxidant species such as hydroxyl radicals (•OH, Eo = 2.80 V/SHE) are able to almost all organic pollutants non-selectively and quickly. However, the use of TiO2 as suspension in water poses the problem of the separation to remove and recover the photocatalyst from treated water. One of the solutions to this problem is supporting the catalyst on suitable support. In this context, this study focuses on the fixing of the TiO2 photocatalyst on a glass support, and the improvement of the photoactivity of TiO2 supported by carrying out a technique called doping. The results obtained showed that TiO2 films supported on glass and doped with copper have improved the photocatalytic efficiency of TiO2 in the degradation and mineralization of methylene blue dye.

Effets des paramètres de soudage sur la résistance mécanique des joints soudés

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Abstract: Friction stir welding is carried out without the addition of metal. The material constituting the cord undergoes large deformations and thermal flows allowing to form a continuity between the basic material and the cord. Lap joints are used to assemble parts in the transportation industry and instead of riveting [1].The utilization of lap joints in airplane structures expands the mechanical properties of the joints and influences weight decrease [2]. In this work we used different information for welding speed (100 125 and 160) mm/min and constant rotation speed 1400 tr/min, We compared the hardness results for each specimen, the welding speed 160 showed the largest value for hardness, and as the welding speed increased, the hardness value decreased in both types of welding simple and double lap joint. The tensile shear results in simple lap welding show that the failure stress increases as the welding speed increases up to the highest value of 11.71 KN and this at the welding speed is 160 mm/min. and the results in double lap welding the highest value of the failure stress was 11.87 KN at the welding speed of 125 mm/min and then decreased at a speed of 160 mm/min. We can learn a lot about the friction welding process with more research to develop it.

Deep traps effect created by proton irradiation on performance degradation of solar cells

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Abstract: Numerical simulation is used in this work to model the effect of 1 MeV proton irradiation on the performance degradation of a GaAs solar cell. The solar cell output parameters are extracted from these characteristics. The proton irradiation induced three deep traps PR1, PR2 and PH5. Simulating the effect of each deep trap level separately helps to find out which of them is responsible for the degradation of a particular output parameter. The simulation results have shown that the GaAs solar cell degradation is very apparent at 1013 p/cm2 proton irradiation fluence. The deepest electron traps PR1 and PR2, with largest capture cross section, are responsible for the performance degradation.

AlxGa1-xAs window layer thickness effect on solar cell output parameters

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Abstract: Space satellites and crafts working outside the atmosphere capture their energy from sunlight. In order to convert solar energy into electrical energy, photovoltaic panels are installed on the surface of satellites or space crafts. In this work we used numerical simulation to study the effect of an AlxGa1-xAs window region thickness on GaAs solar cell output parameters. According to the results obtained, indicate that in the two cases (initial state and degraded state), the only parameters influenced by increasing the thickness of an AlxGa1-xAs window region from 0.09 μm to 0.3 μm leads to an increase in current density of Jsc = 16.29 $mA/cm2$ until Jsc = 16.89 $mA/cm2$ in degraded state. This improves the efficiency of the cell from 5.60 % to 5.84 %. So, the adequate value for the thickness of an AlxGa1-xAs window region is 0.3 μm, to minimize the effect of proton irradiation.

Computational study of structural, electronic and optical properties of (InAs)m(AlSb)n superlattices

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Abstract: Herein, we have predicted that the effect of monolayers (m and n) on the structural, electronic and optical properties of (InAs)m/(AlSb)n (m-n: 1-1, 2-2, 3-3, 1-3 and 3-1) superlattices (SLs) within Density Functional Theory (DFT) calculations based on the full potential linearized augmented plane wave method (FP-LAPW) as implemented in the Wien2K package. We have used the generalized gradient approximation (GGA) in the scheme of the Tran and Blaha's modified Beckee Johnson (TB-mBJ) for exchange-correlation functional. The stability of the vertically stacked SLs is validated by the formation energy Efor(Ry). The results reveal that the (InAs)m/(AlSb)n (m-n: 1-1, 2-2, 3-3, 1-3 and 3-1) SLs semiconductor nature and have a direct bandgap (ΓV-ΓC). As well, the optical properties such as real and imaginary parts of the dielectric function ε(ω), reflectivity R(ω), refractive index n(ω), optical conductivity σ(ω), and absorption coefficient α(ω) were calculated up to 13.00eV. The current work reveals that (InAs)m/(AlSb)n SLs is a promising candidate as a optoelectronic devices.

Insight into the structural, electronic and optical properties of double perovskite LaBaFeTiO6

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Abstract: In this paper, we have conducted a theoretical works on the structural, electronic and optical properties of double perovskite LaBaFeTiO6 for comparison. The calculations have performed using the full potential linearized augmented plane waves (FP-LAPW) method within GGA-PBE formalism in ordered to describe the exchange-correlation potential. The obtained results showed that the equilibrium parameter values are in good agreement with the available results. For electronic properties, the band structures analysis indicate that the double perovskite LaBaFeTiO6 process semiconductor behavior. The optical constants indicated that double perovskite LaBaFeTiO6 is promising semiconductor for optoelectronic applications.

Vanadium doping effect on structural, morphological and optical properties of ZnO thin films developed by spray pyrolysis

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Abstract: Pure and V-doped ZnO thin films were synthesized via spray pyrolysis technique. The influence of V concentration on their structural, optical and surface morphological properties was investigated by using XRD, UV-VIS, SEM and AFM respectively. X-ray diffraction (XRD) revealed that all the films have well crystallized with hexagonal wurtzite structure. The EDX analysis confirms ZnO formation with the presence of V dopant in the films. All the synthesized films show high transmittance (above 83%) in the visible region of 400-700 nm. The surface morphology of the films indicated a remarkable decrease in grain size with an increase in V concentration. As regards the band gap of the films, it was found that it increased from 3.2 eV to 3.25 eV as the concentration of V doping increased.

Effect of annealing temperature on opto-structural properties of cerium doped silicon nitride

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Abstract: Luminescent materials doped with rare earths (Ce, Eu, Yb, Tb ..), are nowadays widely used for flat screen displays, fluorescent lamps and photovoltaic solar cells. Added in inorganic materials they show several fine emission bands in a spectral range from near UV to infrared. Our choice fell on cerium oxide (CeO2), given by their exceptional intrinsic characteristics and their energy levels and the ease of implementation of the synthesis of doped layers. In this study, thin films were obtained by chemical vapor deposition technique of cerium oxide (CeO2) on silicon Nitride (SiNx) layers and then annealed at different temperatures range in N2 ambient. Next, the applied doping process consists of high temperature annealing to be effective in the incorporation and activation of rare earth ions into the SiNx matrix. The effect of heat treatment temperature was examined using scanning electron microscopy (SEM) for structural characterizations. The optical properties of the thin films were studied by a spectrophotometer in reflectance mode to determine different gap energies of the nanostructured layers and adjust these values for photovoltaic application.

Keywords: Cerium oxide, Silicon Nitride, evaporation.

Device simulation of formamidinium tin iodide (〖FASnI〗_3) based perovskite solar cell using SCAPS-1D

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Abstract: As new type of solar cells based Formamidinium tin iodide (〖FASnI〗_3), as one promising Pb-free halide perovskite , 〖FASnI〗_3 perovskite solar cells have attracted great attention because of their ideal band gap of 1.41 eV [1], low toxicity[2], ecofriendly photovoltaic technology and high energy conversion efficiency[3]. Since the first efficient device with a power conversion efficiency (PCE) of 2.10% reported in 2015[4], rapid progress has been made with the PCEs more than 14% [5]. Glass, FTO, Zn(O_(0.3) 〖,S〗_0.7,), 〖FASnI〗_3 ,Spiro-OMeTAD, and metal back contact make up the architecture with SCAPS-1D software is employed in the simulation to examine the effectiveness and performances of this solar cell. The effect of working temperature, thickness of the absorber, on the device's performance is discussed.

Finally, the device simulation with the optimized parameters has resulted in improved output parameters with V_ocof 0.8638 V, J_SC of 32.197451 mA 〖cm〗^(-2), FF of 77.79% and PCE of 21.63 %

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Optimization study of an organophosphorus pesticide degradation with photo-Fenton process: Identification of by-products with GC-MS/MS

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Abstract: The aims of this study is to determine the optimal conditions for the degradation of an organophosphorus pesticide (Diazinon) using the photo-Fenton process, as well as the identification of the by-products resulting from this degradation. The initial concentration of this pollutant was set at 1 mg.L-1as an approach to the real case. The follow-up of the degradation is carried out with an ultra-high performance liquid phase chromatography coupled to a diode barred (UHPLC-DAD). The implementation of an experimental design, namely the Doehlert design, allows to model and optimize the experimental parameters of this process. Three parameters were studied, the concentration of hydrogen peroxide (H2O2), the concentration of ferrous iron [Fe2+] and the pH. The experimental design results were analyzed with the JMP software which allows to obtain the optimal conditions of this degradation as well as the corresponding mathematical model. A total degradation of the parent molecule is obtained after just 5 min, while a total elimination of by-products was obtained after 15 min of experience under optimal conditions, which are [Fe2+] = 29 mg.L-1 (0, 52 mmol.L-1), [H2O2] = 258mg.L-1 (7.59 mmol.L-1) and pH = 4.6. A new concept based on the coupling of the two techniques, QUECheRS extraction (Liq/Liq extraction technique) and GC-MS/MS (gas phase chromatography coupled with a triple quadrupole mass spectrometry) was used for the identification of by -products resulting from the photo-degradation of Diazinon.

Extend the anharmonic oscillator to study the light hypernuclei

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Abstract: Harmonic oscillator is the most important tool used in nuclear physics to study the nuclear structure. Fisrt, It is used in the shell model to describe the spherical nuclei. Then, it was adapted to study the deformed nuclei using Nilsson model. We focus in the present work to extend the deformed Nilsson model based on the anharmonic oscillator to study some light hypernuclei which can be deformed in their ground state , our theoretical predictions results are very encouraged and are very close to the experimental data.

Improvement of a photovoltaic modules cooling using hybrid nano fluids

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Abstract: Improving the electrical performance of photovoltaic cells is essential for the efficient use of energy. This work presents a numerical study that focuses on improving the cooling of a photovoltaic module by using hybrid nanofluid in a hybrid photovoltaic thermal (PV/T) system to improve the electrical efficiency by reducing the temperature of the PV cell. The proposed PV/T system is a set of combined solar collectors, which consists of a photovoltaic module (PV) for the conversion of electrical energy combined with a thermal collector that contains a heat sink with rectangular ribs placed at the back of the PV panel, For a constant value of heat flux of 1000 W/m2 is selected, and inlet fluid temperature is 26 °C, the mass flow rates, and solid particle volumes are chosen as design variables to examine their effects on the Nusselt number (Nu), PV cell temperature, electrical and thermal efficiency. A three-dimensional numerical simulation was achieved using ANSYS Fluent software. The RNG k-ε turbulence model with enhanced wall treatment is chosen as the most appropriate. The results indicate that increasing solid particle volume leads to the thermal conductivity of the rising cooling fluid and hence improving heat transfer by conduction; on the other hand, the increase in fluid velocities enhances heat transfer by convection and therefore an improvement of the heat transfer rate in the photovoltaic/thermal collector (PV/T), resulting in a reduction in temperature and an improvement in the panel's electrical efficiency.

Thermal and Optical Properties of TiO2 doped Sb2O3-CNa2O3-ZnO glasses

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Abstract: Antimony oxide(Sb2O3) based glasses are ones of the Heavy Metal Oxide glasses. They are subject of many researches in the recent years. By using classical routes (melting – casting) [1-3]. Novel glasses synthesized were obtained in the combination of Sb2O3–CNa2O3-ZnO glasses mixed with different concentrations of TiO2 (ranging from 0.2 to 1 mol %) were. The limits for glass have been investigated and the characteristic formation temperatures such as glass transition Tg measured using differential scanning calorimeter (DSC), we noticed Tg decrease with an increasing amount of TiO2. physical characterizations have been carried out on these new glasses (Ultrasound- visible).

Some applications of the Biconfluent Heun differential equation in physics

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Abstract: The biconfluent Heun equation is widely involved in different domains of contemporary pure and applied sciences such as quantum mechanics, general relativity, solid state physics, atomic, molecular and optical physics, chemistry and the number of articles using their solutions have been growing, even in a scenario in which the theory concerning these functions is not yet completed. In this work, we study the DKP equation subjected to the action of combined vector plus scalar energy depend on potentials in (1+1) dimensions space-time. The eigenfunctions are deduced and expressed by the biconfluent Heun polynomials. A numerical study is presented and energy graphs for certain values of the energy parameter are plotted.

Structural electronic properties for the intermetallic alloy CeCuSi

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Abstract: Among Intermetallic phases, the compounds containing rare-earth atoms from numerous Class, well studied for many years in both fundamental and applied research. All known phases are binary or ternary compounds, with some general features .The equiatomic intermetallic ReTX, where (Re) rare- earth element, T=transition metal and X= element of the 3 rd, 4th or 5th main group .In this work, the electronic, structural properties of the Intermetallic CeCuSi crystallize with the hexagonal structure (with the space group P6m2, n°194). In our work we studied the electronic and structural properties of CeCuSi. To obtain these properties have been calculated using the full potential linearized Augmented plane wave (FP-LAPW) method within which is implemented in the wien2K code with the GGA and LDA approximation

Theoretical study of Endohedral Fullerene in Periodic Boundary Conditions

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Abstract: One of the attractive properties of fullerenes intrinsic to their closed-cage structure is the possibility of using them as robust containers for other species like atoms, molecules or ions. The ability of fullerenes to encapsulate foreign atoms within their inner space have attracted a flourishing increase inattention in recent decades. Development of fullerene science was always accompanied and sometimes preceded by theoretical studies. Our interest in this connection lies in the theoretical determination of structure and optoelectronic properties, of fullerene C60 encapsulated by different atoms. The computations of the geometries and electronic structures of these compounds are performed using the density functional theory (DFT) at the 6-31 G(d, p) level of theory and the Perdew-Burke-Eenzerhof (PBE) formulation of the generalized gradient approximation with periodic boundary conditions (PBCs). Moreover, the electronic properties HOCO, LUCO, Energy gap, open-circuit voltage, and the built-in potential are determined. The absorption properties excitation energies, the maximal absorption wavelength, oscillator strengths, and light harvesting efficiency are studied using the time-dependent DFT method.

Structural, Elastic, Electronic , And Optical Properties Of Cubic Si3n4: A First Principles Study

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Abstract: First-principles calculations of the structural, elastic, electronic and optical properties of cubic Si3N4 are carried out using the full-potential linearized augmented plane waves (FP-LAPW) method within the density functional theory (DFT) as implementd in the Wien2k code. The exchange-correlation effects were treated with the local density approximation (LDA) as well as the GGA-PBE and GGA-PBEsol schemes of the generalized gradient approximation (GGA) when calculating the structural and elastic properties. The electronic properties were calculated using the GGA-PBEsol and Tran-Blaha modified Becke-Johnson (TB-mBJ) exchange-correlation potential. The obtained lattice constant of the studied material agrees with the experimental value. The elastic constants verify the mechanical stability and revealed the anisotropic character of Si3N4 compound. Furtjermore, the herein compounds is a direct gap semicoductor. Our results are presented, discussed, and compared with experimental and theoretical data available in the literature.

Theoretical study of the structural, electronic and optical properties of Half-Heusler TaIrPd

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Abstract: We studied the electronic and optical structural properties of Half-Heusler TaIrPd alloy using the total potential augmented plane wave method (FP-LAPW) based on the functional theory of DFT density and implemented in the Wien2k package. The potential for exchange and correlation is processed by generalized approximation of the GGA gradient (PBE96, WC, PBEsol) .The electronic band structure and density of state show that the TaIrPd alloy is an indirect gap in the valence band and the conduction band at points L and X. This means that the system has a semiconductor character. In the case of an indirect bandgap semiconductor, optical transitions through the gap do not can take place only through additional interaction, Optical methods make it possible to characterize a good number of parameters such as the refractive index, the extinction and absorption coefficient, the optical gap... etc. These unique properties mean that these materials are intended for applications various technologies such as optoelectronic devices for telecommunications and photovoltaic cells.

Structural Study and Modeling of a Solar Cell based on Thiophene derivative and Fullerene

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Abstract: Low band-gap organic materials based on composite of an electron-donating conjugated polymer such as thiophene derivatives and an electron-accepting fullerene (D–A) architecture are particularly attractive, because of the facile tenability of their absorption bands, HOMO/LUMO energy levels and carrier nobilities by intra-molecular charge transfer (ICT) from donor to acceptor units. In the present study, DFT calculations are carried out for 3-methylthiophene (C5H6S)n, where n denotes the number of 3-methylthiophène units (n = 1–10). All molecular calculations of optimized structures were performed using the DFT combined with the 6-31G(d, p) level of theory. The calculations were carried out using the GAUSSIAN 09-D package. The visualization of any molecule was carried out using Gauss View 05 program. To gain insight into the optical properties such as the excitation energy and UV/Vis absorption spectra for the singlet–singlet transition of all compounds were simulated using the time-dependent DFT. The calculated values of the HOCO, the LUCO, the gap energy, and Voc of the studied molecules can give an idea on the possibility of efficient electron injection. It was also found that changing the number of thiophene units can effectively modulate the electronic and photo-physical properties of these compounds. The results show that this procedure of theoretical calculations can be employed to predict the optoelectronic properties of other compounds, and further to design novel materials for organic solar cells.

Approximate analytical solutions of the effective mass Dirac equation for the Hulthen potential with any k-value by using the SUSYQM approach

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Abstract: In this study, we present approximate bound state solutions of the three-dimensional Dirac equation for the Hulthén potential in the case of position-dependent mass by applying an approximation scheme to deal with the spin-orbit coupling potential for any k-states. Within the framework of the SUSYQM approach, the bound state energy eigenvalues are obtained. The results obtained are in good agreement with previous works.

DFT study of the structural and electronic properties of Scandium alloys

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Abstract: First principle calculations are used to study the structural, electronic, and thermal properties of Scandium alloys with the help of the abinit code in the framework of DFT functional. The term of exchange and correlation GGA is applied to determine the properties of these alloys with the substitution of the Aluminum element in the range of x=0 to 1. The knowledge lead that the binary compounds, ScAs and AlAs are in rock-salt and zinc-blende, respectively. The effect of atomic concentration, x =0, 0.25, 0.5, 0.75, 1, on lattice constant, bulk modulus, and band-gap energy shows nonlinear dependence on composition x. The deviation of the lattice constant from Vegard's law and deviations of the bulk modulus and gap-energy from linear concentration dependence (LCD) were found. A metallic and semiconductor characters are found respectively for rock-salt and the zinc-blende Scandium alloys which the band-gap undergoes a direct (X → X)-to-indirect (Γ → X) transition.

Ab-initio study of the thermoelectric performance of perovskite ZrBeO3 compound

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Abstract: Full potential linearized augmented plane wave (FP-LAPW) method based on density functional theory (DFT) is used to investigate the structural, electronic and thermoelectric properties of the perovskite ZrBeO3 alloy. For exchange-correlation potential, we have employed the revised Perdew-Burke-Ernzerhof generalized gradient approximation (GGA-PBEsol). The computed electronic structure reveals that ZrBeO3 compound is semiconductor with an indirect band gap of 0.70 eV. Furthermore, the investigations, chemical potential dependance of the Seebeck coefficient (S), electrical conductivity (σ/τ) and hence the figure of merit (ZT) are carried out. The predicted value of the figure of merit ZT is close to unity. This reveals that ZrBeO3 compound is an excellent candidate for practical applications in the thermoelectric devices.

Modulation al instability in higher-order nonlinear Schrödinger equation with cubic-quintic non-Kerr terms

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Abstract: We have studied the modulational instability (MI) in one of the types of the higher-order nonlinear Schrödinger (HNLS) equation in the presence of dispersion and nonlinear higher-order effects and presented a mathematical analytical expression for MI gain to show the impact of the combination of saturable nonlinearity with self-steepening and non-Kerr effects on MI gain spectra. In our work using mathematical analysis and simulation, we found that the dispersion of the non-Kerr effect, makes two similar sidelobes gathered around the zero perturbation frequency, as well its amplitude decreases compared to that induced by the impact of the self-steepening effect.

Effect of waste tyre rubber on mechanical properties of cement mortar

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Abstract: Disposal of waste tyre rubber has become a major environmental issue in all parts of the world representing a very serious threat to the ecology. One of the possible solutions for the use of scrap tyre rubber is to incorporate it into cement mortar, to replace some of the natural aggregate.

This paper also reviews the performance of concrete mixtures incorporating 10%, 20% and 30% of discarded tyre rubber as sand replacement in order to obtain materials with low environmental impact. Even though the mechanical properties decrease when rubber content in the mix is increasing, rubber particles may improve some desired technical characteristics such as; porosity, ductility and cracking resistance performance.

An interesting alternative to producing a mortar respecting the environment by the use of waste tyre rubber has been proven by this study.

Study of the finite-mass effects on some response functions for the system of the hadronic gas-quark gluon plasma phases coexisting in a finite volume

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Abstract: To investigate the thermally driven QCD Deconfining Phase Transition (DPT), from a hadronic gas phase to a Quark Gluon Plasma (QGP), in a finite volume at zero chemical potential, we adopted the idea of examining thermodynamic quantities called response functions which give a concise description of the DPT. We dealt with the order parameter of the DPT, its first thermal derivative which represents the susceptibility and the second cumulant of the probability distribution representing the variance. For the study of the finite-mass effects, we illustrate the variations of the previous quantities in the case of massless particles and in the case where massive particles are included. These mean values are calculated using the QGP color-singlet partition function obtained within the projection method. The such obtained results are translated into graphs, with varying temperature and for different volumes of the mixed system. We notice, in addition to the similarity between the behavior of the thermal susceptibility and the behavior of the second cumulant of the probability distribution representing the variance, that the transition temperature is lowered in the case of considering massive particles in the system.

Synthesis of biopolymer-based hydrogels and study of their applications

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Abstract: In 1869, Jacques-Louis Reverdin (1842-1929) made an important discovery, grafting the skin or skin transplantation. Brown et al. developed their two-layer skin grafting technique in 1929. Since these discoveries, grafting has become an essential technique in dermatology. However, sometimes skin grafting is difficult or impossible, in which case dermatologists use tissue regeneration using synthetic materials. hydrogels are synthesized by different methods and used in various fields including pharmacy, agriculture, texture and the medical field(1).In this work we will demonstrate tissue regeneration by biodegradable and biocompatible hydrogel based on Silk fibroin. The characterizations and the analyzes by deferent techniques unravel the modification that we made to the latter to improve its physicochemical characteristic for used well in the biomedical field as much as tissue scaffolding

Effect of renewable leaves of Satureja hortensis L. essential oil on the shelf-life of liquid whole eggs during storage

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Abstract: The S. Hortensis Eo Was Obtained From Dried Aerial Parts Of Plant By Hydro-Distillation. The Compounds Were Identified By Linear Retention Index (Lri) For Analysis Of Gas Chromatography– Mass Spectrometry Data. In Vitro Antioxidant Activity Was Determined By Dpph Radical-Scavenging Methods. To Evaluate The Potential Biological Capacity Of Savory Eo In Liquid Whole Eggs (Lwe), The Shelf Life Extension Of Eo Treated Lwe Was Undertaken. The Storage Of Lwe Demonstrated That Treatment With Summer Savory Eo Resulted In An Increase Of Retail Shelf Life. Results Revealed That Treated Samples With 400 Ppm Savory Eo Showed Two Additional Days Of Shelf Life Compared To Control Samples. Moreover, Samples Treated With Lwe 800 And 1000 Ppm Savory Eo Did Not Suffer A Notable Deterioration, As Indicated By The High Retail Shelf Life Period, Which Was Extended Three Additional Days Compared To Control Samples. The Eo Extracted From Algerian Summer Savory Contained 92% Bioactive Monoterpenes, Both Hydrocarbons (35.6%) And Oxygenated Ones (56.4%). Results Showed That The Oxidative, Microbial And Sensory Stability Of The Liquid Whole Egg Was Positively Influenced By The Treatment With Summer Savory Eo, Even Increasing The Shelf Life To More Than Eight Days. Therefore, The Results Obtained Confirm That The Addition Of Summer Savory Eo Is A Promising Technology To Extend The Commercial Life Of Egg Products, Which Could Be Applied At An Industrial Level As Renewable Materials.

AB initio calculation of structural, electronic, elastic and Optical properties of YxGa1−x As alloys

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Abstract: In this work we have performed a theoretical study using the full potential linearized augmented plane wave approach (FP-LAPW), based on the theory of density functional theory (DFT) implemented in the Wien2K software; to determine the structural, electronic, elastic and optical properties of YxGa1−x As alloys as a function of yttrrium concentration (x).

firstly,we performed our calculations on the most stable phases , NaCl and zinc blende, then their transition pressure for each concentration is determined and analysed. Our computed results for the zero yttrium concentration are found consistent with the available experimental measurements as well as with theoretical predictions, Moreover, the dependencies of these structure, electronic energy band gap results and density of states, A systematic study on optical properties to analyse its optoelectronic character and elastic properties is presented..

A simulation model of the dense compaction of bidimensional mixture

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Abstract: In this work, we used a new approach to study stacks of bidimensional spherical particles, which allows to evaluate new parameters such as the size ratio x between large particles and small particles and the volume fractions of each type of particles. particles with a mathematical optimization of the phenomena that accompany this type of mixture. The obtained equations are adapted to be used to calculate the relative density of mixture according to the parameters considered.

Synthesis And Structural Characterization Of A Composite Material Ni-Wc, And Study The Different Concentrations Of Wc Particles

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Abstract: During the last decades researchers have tried to improve the properties of metal matrix coatings by reinforcing it with fibers or particles which are characterized generally by rigid, strong and light such as oxide (Al2O3, TiO2, SiO2) or carbide (SiC, WC) particles, diamond, solid lubricant (PTFE, graphite or MoS2), or even microcapsules containing liquid [1-4].

In this work, we study the influences of WC solid particle concentrations on the structure, surface morphology, mechanical and electrochemical properties of Ni-WC composite coatings electrodeposited on previously treated copper substrates. The corrosion behavior of Ni-WC composite coatings was studied by the methods of potentiodynamic polarization and electrochemical impedance spectroscopy (EIS) in a corrosion medium (0.1 M HCl). EDS analysis asserted that WC is the embedded particles and nickel is the matrix. The incorporation of solid WC particles into the nickel matrix forms heterogeneous deposits containing deep and narrow pores. The microhardness of the deposits increases with increasing WC concentration in the electrolyte bath. The corrosion tests show that the 1 g/L sample immersed in the 0.1 M HCl solution are the optimum conditions based on the lowest corrosion density and the highest load transfer resistance value.

Electronic and Optical Properties of the Double Perovskite Rb2PtCl6 Semiconductor via First-Principles Calculations

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Abstract: The highly successful GGA-PBE approximation was used to calculate the structural , electronic

and optical properties of the double perovskite Rb2PtCl6 compound which crystallize in cubic structure with space group Fm-3m N° 225 using the density functional theory ,a First-Principles (Ab-initio) approach implemented in WIEN2K code .The calculated parameters (Lattice constant and Bulk modulus) are in tune with available data .The Rb2PtCl6 exhibit a semiconducting behavior with direct band gap with Eg=2.3 eV The electronic properties are determined mainly by Rb-Cl bonding which, in turn, depends on Pt-Cl bonding. Our results: band structure, as well as densities of states are in good agreement with the available theoretical data that previously reported in the literature. The optical responses like the good absorption, reflection and energy loss with the ideal band gap make that our studied compound suitable for the optoelectronic /Solar-Cell applications.

AB - initio study of structural, electronic and Optical properties of GaBi and GaP binary compounds

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Abstract: For several years, III–V zinc blende semiconductors have attracted the attention of various teams and laboratories around the world because of their use in electronic and optoelectronic devices and they have been widely studied theoretically and experimentally in the course of the last half century . Our work is based on an ab-initio theoretical study of structural properties, electronics and optics for GaBi and GaP binary compounds which crystallize in the most stable structure (zinc blende). We employ the FP-LAPW method. Within the frame work of the density functional theory (DFT). As implemented in the wien2K code. The exchange-correlation potential for structural properties was calculated by the generalized gradient approximation (GGA) in the new form (WC) proposed by Wu and Cohen. In addition and for electronic properties only, we also applied the modified Becke-Johnson (mBJ) To calculate the structural properties, we have taken the WC-GGA approximation as the exchange and correlation potential term. To calculate the electronic properties of our binary compounds, in addition to the WC-GGA approximation the Becke and Johnson modified potential approximation (mBJ) is also used. Finally, we end this study with a conclusion retracing all the significant results that we have obtained.

• The Zinc Blende structure is the most stable for the two binary compounds GaBi and GaP.

• We observed for electronic properties direct and indirect band gap.

• The imaginary and real parts of the dielectric function , are calculated.

• The simulations carried out in this work show that the lattice parameter, the compressibility modulus, the energy gap and the refractive index, are close to the experimental data.

The optical, structural, morphological, and electrical properties of Cr2O3 thin films elaborated by pneumatic spray at different concentration

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Abstract: Cr2O3 thin films have been synthesized successfully on glass substrates at 450 °C using a simple and low-cost home-made pneumatic spray pyrolysis system (SPT) using chromium chloride. A systematic study of the influence of concentration of each precursor used for deposition on the structural, morphological, optical and electrical properties has been investigated. The X-ray diffraction results show that the Cr2O3 films prepared with chromium chloride are polycrystalline with Rhombohedral structure. Peaks associated with Cr and O elements are present in EDS analysis witch confirm the composition of the films and SEM images revealed a uniform, homogeneous and well covered surface without any observable cracks. Electrical conductivity measurements were carried out using four -probe method and found conductivity in the order of 102 (Ω.cm) −1. The optical study confirms that the transmittance of Cr2O3 films decreases with the increase of precursor concentration. The average transmittance of the films 75 % in the visible region (Eg varies from 3.40 to 3.53 eV).

Characterization of TiO2 Nanopowders Elaborated by Sol-gel

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Abstract: In this work we synthesized nanometric powders of pure TiO2 and co-doped with Ag, Zn and N with the concentrations: 3 and 7% using the sol-gel method. The powders obtained are annealed at 500°C. The effects of Ag-Zn-N three-element doping on structural and optical properties were studied. The characterization by XRD showed that the size of the grains decreases according to the concentration of the dopant, and the edge of absorption obtained by UV-Visible is shifted towards the greatest energies for the doped TiO2.

Soft Chemical Synthesis and Electrochemical Characterization of the Scheelite SrMoO4: Application to Photocatalytic Degradation of Rhodamine B.

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Abstract: The molybdates AMoO4 (A = Sr, Ba, Ca) crystallize in a scheelite structure and have tetragonal crystal symmetry with space group I41/a. Each Mo site is surrounded by four equivalent O sites forming a tetrahedral configuration; each A site is surrounded by eight O sites forming an octahedral configuration. Due to the interactions between Mo d and O 2p electrons and which contribute to ionic bonds. As a result, the AMoO4 are considered as semiconductors materials with wide band gap.

particularly SrMoO4 has attracted much attention because of its physical and chemical properties, it is chemically and thermally stable and thanks to electronic transitions in the electronic orbital pattern of unperturbed [MoO4]2-complexes, it emits green or blue luminescence at room temperature.

In the present study SrMoO4 was synthesized by soft chemistry at room temperature and the formation of single-phase was identified by X-ray diffraction (XRD). The powder was characterized by the Fourier transform infrared (FTIR) spectrum. The microstructure, visualized by scanning electron microscopy (SEM), showed spherical grains (5 - 2.5 nm diameter), and the crystallite size (~ 44 nm) was evaluated from the broadening of XRD peaks. The UV–Vis diffuse reflectance spectroscopy gave a direct optical transition at 4.26 eV. The electrical properties of SrMoO4 are characteristics of a semiconducting behavior. The electrochemical characterization was undertaken to build the energy diagram of SrMoO4. As application, the semi-conductor is successfully tested for photocatalytic degradation of a hazardous dye stabilized by the mesomeric effect namely Rhodamine B

Study of the performance of a solar thermal collector on different locations in Algeria

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Abstract: In this work, a numerical simulation of heat production in different sites in Algeria was presented, the simulation was carried out using TRNSYS software, in order to study the evolution of the output temperature of the solar collector during the whole day and to analyze the useful energy flow on two sites in the south of Algeria precisely in Tamanrasset and Bechar, finally, We have calculated the efficiency of the solar collector as a function of the water flow rate used. The results show that the site of Tamanrasset and more favorable than the site of Bechar, the optimal output temperature was observed in the middle of the day. The results also show that the increase of the flow of water improves the efficiency of the solar collector in a proportional way, the rate of improvement is 80% in the region of Tamanrasset and 71% in Bechar for a mass flow equal to 150 Kg/h.

Structural, optical, morphological and photocatalytic properties of calcium-doped iron oxide nanostructures deposited by sol-gel process

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Abstract: Nanomaterials are of great interest for theoretical studies and technological applications because of their different physical properties at this scale. Iron oxide-based nanostructures have been considered as a promising candidate in several fields of nanotechnology such as photovoltaics, optoelectronics, spintronics and photocatalysis, mainly owing to its outstanding characteristics. The properties of iron oxide can be greatly enhanced by the addition of dopant. For this purpose, undoped and calcium-doped iron oxide thin films were prepared by a sol-gel process. Dopant concentration is varied as 3%, 5% and 7%. The structural, optical and morphological properties of the prepared samples were characterized by X-ray diffraction, UV visible spectra and scanning electron spectroscopy. The results revealed that the structural and optical properties of the samples improved with increasing calcium concentration. In addition, a variation in morphology was also observed. Calcium doping significantly improved the photocatalytic activity for methylene blue degradation under visible light irradiation.

Removal of an organic polluant by photo-catalytic processes in aqueous solution. Environmental application

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Abstract: The current study aims to remove the textile dye basic blue (bb41) by combining the adsorption and photocatalysis processes in the presence of a zno/clay heterosystem. The study consists of first preparing a clay impregnated with an elaborated zno semiconductor, which is then analysed using two physico-chemical analytical techniques: x-ray diffraction and zero charge point. Second, the effect of operating factors on photocatalytic degradation was discussed, including the ph of the solution and the initial concentration.

The results demonstrated that linking the two processes of adsorption and photocatalysis revealed a synergistic effect between them. For an initial concentration of 20 mg/l, a ph of 7, a temperature of 25 °c, and a catalyst dose of 1.25 g/l, a photodegradation rate of 99.1% was reported. In general, these processes may be classified as clean-pollution processes that use renewable energy and are part of a long-term development strategy.

First principles study structural and electronic properties of hydrogen storage in Li6AlNaH8 hydride

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Abstract: First-principles calculations based on density functional theory using the Wien2k code with the self-consistent full potential linearized augmented plane wave (FP-LAPW) method used the Perdewe-Burkee-Ernzerhof generalized gradient approximation (GGA), in the hope of improving hydrogen storage properties we have calculated structural and electronic properties of the hydride Li6AlNaH8 we have calculated formation energy and desorpation temperatures and gravimetic hydrogen storage, The formation energy shows that there is a gradual decreasing in the stability of the hydride lithium, This hydride which favorite easily the hydrogen storage and the hydrogen restitution compared to hydride lithium

Effect of temperature, layer thickness, ND and NA densities on performance of metal oxide solar cell

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Abstract: Metal oxide semiconductors have several advantages for photovoltaic cells, including being abundant, non-toxic and chemically stable, they are promising materials for photovoltaic (PV) applications due to their potential to reduce the price of (PV) and their inexpensive production method. In this work , we evaluated some specific parameters of n-TiO2/p-CuO heterostructure under illumination using solar cell simulation software (SCAPS– 1D) and we also model the effect of temperature, thickness of p and n regions, the donor and acceptor densities ND and NA respectively, Our simulation revealed that the increase in temperature reduces the photovoltaic parameters of the solar cell. The efficiency of n-TiO2 / p-CuO solar cells can be improved by increasing NA acceptor density. Increasing the thickness of the absorbent layer p-CuO increases the number of photons to be absorbed and the efficiency of the cell while a thick buffer layer n-TiO2 reduces cell performance. The results of our simulation are in good agreement with those of the literature.

Theoretical prediction of structural, elastic and electronic properties of the CaMg2Al2N4 and SrMg2Al2N4 materials

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Abstract: The present work explores the structural, elastic and electronic properties of the tetragonal CaMg2Al2N4 and SrMg2Al2N4 materials[1]. Using the pseudopotential plane-wave method in the framework of the density functional theory within the generalized gradient approximation GGA-PBE sol [2]. The calculated results of the lattice constants and internal coordinates are in very good agreement with the experimental findings, the deviation is less than 1.5%. The calculated electronic band structure, total and partial densities of states reveal that this compounds are an indirect narrow-band-gap semiconductor of about 2.2 and 2.3 eV for CaMg2Al2N4 and SrMg2Al2N4 respectively. The computed single crystal elastic constants show that C11 is slightly higher than C33, indicating that the studied crystals are more resistant to compressional strains along the a-axis than c-axis [3].

Study of a thin film solar cells based on CZTSSe using SCAPS-1D Simulator - Effects of doping in the absorber layer, and its operating temperature

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Abstract: The manufacture and development of solar cells are currently the subject of major investment projects and research works in order to achieve an exploitation of solar energy with higher performance than possible. The study of solar cells by simulation presents an essential tool to have predictions, particularly before the CZTSSe cells fabrication. In this perspective, we have done a work of SCAPS simulation of CZTSSe solar cells, in order to study some physical effects on the electrical properties and the yield of these cells. Note that he record efficiency of the CZTSSe solar cells can be of 7.3 to 12.6 %. In this study, it has essentially been found that the characteristic values of current-tension (I-V) and the output parameters (Vco , Icc , FF, η) are proportional to the thickness, the doping concentration and the temperature of the layers of CZTSSE as indicated in the following table:

Effect	Vco (Volts)	Icc (mA/cm^2)	FF (%)	η (%)
Absorber layer thickness : 1 - 5 (µm)	0.285 – 0.385	21.544 – 31.458	55.35 – 73.47	40 – 8.91
Doping concentration $N_{A/CZTSSe}$: 10^{15} - 1.6 x10^{16} (cm^{-3})	0.385 - 0.504	31.458 - 29.869	73.47 - 78.92	8.91 - 11.90
Operating temperature : 275 - 300 (°K)	0.5090 - 0.5046	29.854 - 29.869	80.11 - 78.92	12.17 - 11.90

Stimulating results for a more in -depth study by playing on other key and promising parameters to develop this type of cells in the laboratory.

Temperature effect on optical and structural properties of CdS thin films grown by chemical bath deposition

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Abstract: Cadmium sulfide (CdS) is an important and useful material for applications in photovoltaic devices. In particular, thin films of n-type CdS are widely used as a window layer in heterojunction solar cells. The film elaboration was carried out by chemical bath deposition method from a solution containing Cadmium sulfate, Thiourea, ammonium hydroxide and Ammonium Chloride. The influence of the deposition temperature varied from 50 °C to 70 °C in a step of 10 °C on the crystallographic structure, morphology as well as optical properties was investigated by X-Ray diffraction, Fourier Transform Infrared spectroscopy , scanning electron microscopy and UV-Visible spectrophotometry. Increasing deposition temperature can promote phase transformation from cubic to hexagonal and improve the film crystallinity. The average crystallite size was found to increase by deposition temperature increasing, while the optical band gap values range between 2.38 and 2.45 eV.

Efficiency of wastewater treatment doped with organic dye by adsorption process

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Abstract: This work deals with the elaboration of activated carbon from red pumpkin skin by chemical activation with potassium hydroxide, then their application for the elimination of methylene bleu. The physical characterization of our activated carbon by Fourier Transformation Infrared and X-ray Diffraction well showed the possibility of its valuation. The best yields were obtained at basic pH, and room temperature (293K). Equilibrium data were analyzed by Langmuir, Freundlich and Temkin isotherm models. The modeling of kinetics obeys the pseudo second order. Thermodynamic parameters study showed that methylene bleu adsorption process on adsorbent was spontaneous and exothermic.

Development of an activated carbon based on agricultural waste for the treatment of polluted water

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Abstract: The protection of the environment against pollutants requires the use of the economic adsorbent. In this study, the activated carbon was prepared from an agricultural waste which was chemically activated by various agents (KOH, H3PO4). The activated carbons are used as adsorbents for the purification of water charged with anionic dye (Congo Red). The adsorbents were characterized by SEM and pH isoelectric point, the ash rates and moisture content. The influences of various parameters such as temperature, pH, mass, concentration, stirring speed and contact time were studied. The modeling of kinetics obeys the pseudo second order and the Langmuir and Freundlich model correctly describes the adsorption isotherms.

Calculation of inelastic cross section in hot plasma

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Abstract: When the impact approximation is valid, the half-width of a line broadened by collision is easily deduced from the expressions of the excitation and de-excitation cross sections. For inelastic collision, the cross section is written in terms of the trajectory of the perturber electrons, for an expression of the dipole potential interaction and the first expression of the transition matrix. In high temperatures (hot plasma), the free electrons are affected by these conditions. In this work, we applied the correction on the trajectory of the electrons calculated with relativistic corrections to calculate the inelastic cross sections, which are useful in the calculation of the stark broadening, the obtained results show that the relativistic corrections increase the values of the cross section and therefore the Stark broadening.

Ag capping layers for stabilization of copper solar cell contacts

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Abstract: Copper contacts can provide significant cost savings over screen printed Ag for industrially produced Si photovoltaic cells, however concerns exist with regard to the stability of Cu contacts with time [1]. This work investigated the effect of Silver (Ag) capping layers and their method of application by electroless and electrochemistry on the stability of electrodeposited Copper solar cell contacts (Cu) on Silicon (Si) substrate. Optical microscopy micrographs showed a Cu dislodging and change in its color with time. The application of Ag capping layers significantly improves the adhesion of the electrodeposited Cu with Si substrate and maintained the Cu color, revealing that the Ag layer effectively avoided the contact between the oxygen and Cu, which led to preventing Cu oxidation. However, the electrodeposited Ag layer on Cu resulted in whisker formation induced by the injected current density, which have a detrimental effect on the reliability of microelectronic devices [2]. Scanning Electron Microscopy (SEM) showed a formation of dendrite shaped Ag nanoparticles on the electrodeposited Cu with particle size larger for the electrochemistry method than the electroless one. Electrical properties evaluation using four-point probe showed an increase in the sheet resistance of electrodeposited Cu with aging time. The application of Ag capping layers maintained the sheet resistance at the initial value even after two months, highlighting the role of Ag capping layer in the stabilization of Copper solar cell contacts against oxidation.

Synthesis, characterization and photocatalytic performance of TiO2 nanotubes

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Abstract: The specific surface area of semiconductors in general is a physical characteristic that has a direct influence on their photocatalytic activity. The pollutant adsorption is a crucial step in the photocatalytic reaction, its importance lies in the fact that it leads to the transfer of the pollutant to the surface of the catalyst particles, which is characterized by a high density of hydroxyl radicals, these chemical species are responsible for the degradation of pollutants. To increase the titanium dioxide TiO2 performance in elimination of pharmaceutical pollutant cefixime, morphological modifications were made by changing the TiO2 nanoparticle shapes into nanotubes by hydrothermal treatments to increase the specific surface area of the catalyst and therefore the adsorption capacity. TiO2 properties were investigated by different characterization technics such as BET and XRD, photocatalytic activity of synthesized TiO2 nanotubes was examined in a solar photocatalytic reactor.

Synthesis of polystyrene decorated with CuCr2O4 nanoparticles for enhanced photodegradation of Cefixime under visible light

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Abstract: In recent years, industrialization has constantly increased. Therefore, the rapid increase in different types of pollution has become unavoidable[1], which certainly leads to the deterioration of the environment. Previous studies have reported that quantities of antibiotics have been found in the discharges of the pharmaceutical industry even after treatment, remain in the water and contribute to strengthening bacterial resistance[2,3]. In this regard, photocatalytic degradation has been revealed to be a promising technique for the effective destruction of persistent organic compounds in polluted waters[4]. Furthermore, the presence of a semiconductor is an important parameter for the photocatalytic reaction. Various types of semiconductors have been reported in the literature. The use of catalysts in suspended powder form in the photocatalytic reaction, especially at the posttreatment level, where it leads to limitations such as agglomeration and difficulty of recovery[5]. For this purpose, polystyrene beads (PS) were used to support the CuCr2O4 particles using a facile and inexpensive method. This photocatalyst was characterized by powder X-ray diffraction (XRD), the optical characteristics was obtained by UV–Visible spectroscopy, The photocatalytic performance of the CuCr2O4-PS prepared photocatalysts was evaluated under visible light irradiation, for the degradation and mineralization of an antibiotic (Cefixime) under visible light irradiation. A mineralization efficiency of 94% was achieved after 180 min for Cefixime concentration of 10 mg/L, in comparison with 5% efficiency reached by photolysis.

Non-relativistic eigensolutions of VH, TiC, TiH Under exponential-type potential

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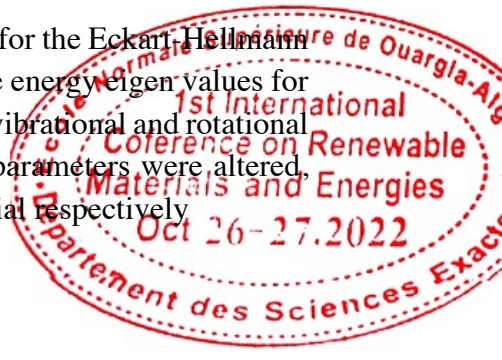
Abstract: We obtained an approximate solution of Schrdinger equation for the Eckart-Hellmann potential model, using the factorization method to obtain the bound state energy eigen values for VH, TiC, TiH and CuLi diatomic molecules were computed for various vibrational and rotational quantum numbers, special cases were considered where the potential parameters were altered, resulting into Eckart potential, Hellmann potential, and coulomb potential respectively



Comparative Study of Different Intelligent MPPT Techniques for PV System

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Abstract: This paper provides a comparative study between conventional algorithms P & O and advanced algorithms of monitoring of the point of maximum potency (MPPT) based on the control of blurred logic (FLC) and the network of artificial neurons (ANN) for an autonomous application. To attain the point of functioning, offered techniques MPPT control the cyclical report of a converter DC-DC which interface the load and the generative FINE. Conventional algorithm P &O is discussed owing to its simplicity and its weak expense of implementation, but its dynamic behaviour is considered to be the worst, particularly in the quick changes of radiation. As a result, FLC and ANN are being supposed to do be more competitive in terms of elimination of the waves of potency and precision of monitoring. However, the results of simulation were recorded by using Matlab / Simulink. These results prove the privilege of techniques moved forward in comparison with conventional algorithm.

Physical properties studies of spray pyrolyzed Sn, Al doped and co-doped CdO thin films

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Abstract: TM (TM = Sn, Al) doped and co-doped CdO thin films were deposited by spray pyrolysis technique on glass substrate at temperature 350 ˚C. The effect of TM doping and co-doping on the structural, optical, and electrical properties of CdO thin films was investigated. The obtained films are crystallized in the cubic structure and oriented along the preferential (111) crystallographic plane. The average optical transmittance reaches 79% in the visible range for Sn doped CdO films and 74% for Al-Sn co-doped films. The gap values of the obtained samples are between 2.29 and 2.49 eV. All the deposited films exhibit n-type conductivity with a low electrical resistivity of 7.85.10-4 Ω.cm obtained for Al doped CdO films. According to these results, doped CdO thin films are promising to be useful in various optoelectronic applications, as a window layer in solar cells.

Synthesis of nanomaterials Fe-LDHs with different molar ratios Fe/Al.

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Abstract: Layered double hydroxides (LDHs) are known as anionic clays or hydrotalcite based on the structure of Brucite charged positively (Mg(OH)2). The principal interest of the layered double hydroxide lies in the possibility of modifies the layers by insertion or substitution of divalent and trivalent cations. Layered double hydroxides can contain different types of divalent and trivalent cations like magnesium; aluminum; zinc, nickel [1], cobalt [2], chrome; iron, and gallium ions [3]. A range of Fe-LDHs has been synthesized by co-precipitation using metal nitrate precursors and sodium carbonate under varying molar ratios Fe/Al (Fe0.05–Al0.15, Fe0.10–Al0.10, Fe0..14– Al0.06, and Fe0.15– Al0.05). The nanomaterials Fe- LDHs were characterized by powder X-ray diffraction and N2 adsorption–desorption. The solids showed clear hydrotalcite-like crystalline phases having a particle measurement between 7 and 16 nm. The best structure is attributed to the sample Fe0.15– Al0.05-LDHs. The particular surface area is about 92 m2/g.

Algebraic solutions of shape invariant systems with position dependent effective mass

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Abstract: In recent years, the study of position-dependent mass (PDM) systems has attracted great interest, both theoretically and experimentally, because of its multiple applications in different areas of physics and chemistry. Many contributions to the fundamental understanding of the problem have been made from different perspectives. We will approach the solution of the Schrödinger equation for bound states by considering an interesting model proceeding by the generalized supersymmetry approach in quantum mechanics. In many areas of relativistic and nonrelativistic physics, the concept of supersymmetry is frequently used, and supersymmetric quantum mechanics (SUSYQM) has become a distinct academic discipline. In addition, the actual potentials meeting the shape invariance criterion in the SUSYQM paradigm are precisely soluble within the Schrödinger equation. In particular, we are interested in determining the limit states of a mass particle dependent on the position and subject to a unidimensional harmonic potential. The method used to obtain the solutions is based on the concepts of supersymmetric quantum mechanics and shape invariance. In order to illustrate the general formalism, a class of nonlinear oscillators has been considered. This class includes the particular example of a one-dimensional oscillator with different effective mass profiles as a function of position. The mass distribution is taken as if x>- and the potential is considered as where is a positive real constant. The spectrum and the corresponding wave functions are thus exactly obtained and special cases are discussed.

A first principles investigation on the structural, elastic and thermodynamic properties of Ag-based oxides KAgO and RbAgO as a function of pressure

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Abstract: Structural parameters, elastic constants and thermodynamic properties of the tetragonal ternary Ag-based oxides KAgO and RbAgO are investigated theoretically for the first time using the plane-wave ultra-soft pseudopotential method based on the density functional theory. The optimized lattice parameters and atomic positions agree well with the available theoretical and experimental counterparts. Pressure dependence of the structural parameters is also explored. Pressure dependences of the single-crystal elastic constants Cij for KAgO and RbAgO are explored. The elastic wave velocities propagating along the principal crystallographic directions are numerically estimated. The elastic anisotropy is estimated and further illustrated by 3D-direction-dependent of the Young's modulus. A set of some macroscopic elastic moduli, including the bulk, Young's and shear moduli, Poisson's coefficient, average elastic wave velocities and Debye temperature, were calculated for polycrystalline KAgO and RbAgO from the Cij via the Voigt-Reuss-Hill approximations. Through the quasiharmonic Debye model, which takes into account the phonon effects, the temperature and pressure dependencies of the bulk modulus, unit cell volume, volume thermal expansion coefficient, Debye temperature and volume constant and pressure constant heat capacities of KAgO and RbAgO are explored systematically in the ranges of 0–20 GPa and 0–1200 K.

Computational insights in predicting structural and optical properites of EuAlO3 cubic-perovskite using FP-LAPW method

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Abstract: In this work, we have investigated structural and optical properties of EuAlO3-cubic perovskite using FP-LAPW. Structural and optic results obtained using GGA-PBEsol have shown the ferromagnetic phase stability of EuAlO3. Furthermore, optical properties, including real and imaginary parts of the dielectric function, refractive index and extinction coefficient have been investigated

A Comparative Study of Electronic Properties of Bulk MSe2(M=Mo, W) and Its Monolayer Using DFT

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Abstract: MoSe2 and WSe2 are a member of the family of transitions metals dichalcogenides (TMDCs), Which has recently gained considerable attention for various applications in electrochemical, Photocatalytic, And optoelectronic systems.

Our work consists a comparative study of electronic properties of bulk MSe2 where M(Mo, W) and Its Monolayer, The calculations were performed using the Quantum Espresso computational tool, Along with density functional theory (DFT) with ultra-soft pseudopotentials. We studied the structural properties such as lattice parameters a and electronic properties of bulk and monolayer MSe2, The bulks molybdenum diselenide and tungsten diselenide exhibits an indirect gaps semiconductors behavior with indirect band gaps of 1.39 eV and 1.40 eV respectively, Whereas in the monolayer-MoSe2 and WSe2 the band gaps were found to be direct one with 1.47 eV and 1.54 eV respectively, The calculated density of states (DOS) may help explain this change in the nature of band gap in bulk and in monolayer MSe2(M=Mo, W) .Generally, The agreement between our results, with available experimental and theoretical results is satisfactory

Simulation Study of Ultra-Thin Insulated Gate Bipolar Transistor IGBT

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Abstract: Current topics such as electro-mobility and renewable energy demand the development of power devices with high voltage and current ratings along with minimum switching losses [1]. Amongst the power devices in today's market, IGBTs have gained a lot of significance in this field over its competitors like Power MOSFETS and Thyristors [2]. The purpose of this work is the study of IGBT thin film transistors and the impact of different critical region sizes in their electrical characteristics. By optimizing critical region sizes of the device, in order to have optimum transistor performance[3]. Especially, the investigation of the impact of these parameters for the breakdown voltage. The static analysis (DC) of the proposed IGBT structure is executed by using a two-dimensional (2D) simulation of the TCAD SILVACO Software. The developed device exhibits an excellent density is of the order 66.66 A/cm2. The ION to IOFF ratio is in the order of 107. The threshold voltage of the IGBT is 3V. A predictive breakdown simulation of the Ultra-Thin Substrate IGBT is done to get an idea about the expected breakdown of the device in both the forward and reversed biased region. The forward Breakdown Voltage are 771 V and the reverse Breakdown Voltage are 846 V.

Physical and Optical Properties of Zinc Doped Nickel Oxied Thin Films Fabricant Semiconductor

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Abstract: In this work, we have prepared zinc doped nickel oxide thin films by using the spray pyrolysis technique deposition on glass substrate. We have prepared Zn doped NiO thin films with different doping levels (0, 0.02, 0.04 0.08 and 0.12 %) for Ni1-xZnxO. The thin films were deposited at substrate temperature of 450 C° for 7 minutes. In this work, we have studied the change of the physical and optical properties of thin films with different doping levels. From structural characterisation, it was confirmed that the Ni1-xZnxO thin films have a high crystallinity and polycrystalline in nature with cubic structure (1). Crystallite size in Ni1-xZnxO thin films decreases with increasing doping levels x to minimum value of 9.87376nm at x=0.04 (2). However, thin films have a high transparence which is about 70 to 80% of transmission in the visible region (3). The band gab energy (Eg) in the thin films decreased with increasing doping levels x from 3.67 to 3.61 eV at x=0.04 (4). The Urbach energy (Eu) in thin films decreased with increasing doping levels x from 282 to 246meV at x=0.12(5). The electrical conductivity of the thin films increases with increasing doping levels x to maximum value of 0.012 (Ωcm)-1 at x=0.04. The doping level x=0.04 has the best results of deposited thin films.

Investigation of HCl-PANI / PSiC thin film for application in energy storage

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Abstract: Polyaniline (PANI) thin films were successfully synthesized using the electrodeposition technique from a mixed solution of 0.2M aniline and 0.5M HCl into porous silicon carbide (PSiC:H). The obtained HCl-PANI film was confirmed with scanning electron microscopy (SEM) and FT-IR measurements. The electrochemical supercapacitor properties of HCl-PANI/PSiC electrode were examined using cyclic voltammetry, galvanostatic charge-discharge and electrochemical impedance spectroscopy measurements. A specific capacitance of ~127 Fg-1 in a 0.5 M HCl electrolyte was attained and a good stability over 10 000 cycles, was revealed

Zr-pillared montmorillonite clay as host to cationic and anionic organic molecule

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Abstract: Industries are the main source of water pollution due to release of toxic pollutants including surfactant or dyes. It becomes urgent to propose low cost and environmentally friendly involving the use of local resources. Here, the properties of the Zr- pillared smectite, with the Zr to adsorb to organic molecules: the 1-Butyl-3-methylimidazolium chloride and the fluorescein are investigated.The adsorption isotherms as well as the kinetic are measured. The X-ray diffraction (XRD) was done to determined le location of the organic molecule the dyes. For the 1-Butyl-3-methylimidazoliumthe adoption capacities in not enhanced by the presence of pillars. In addition, the molecule is not intercalated.The FTIR is another tool to confirm the differences between modified and unmodified montmorillonite samples. More specifically, the results showed that the formation of new bands of vibrations (1450 cm-1) and (closer to 2960 and 2874 cm-1), which correspond to the presence of 1-Butyl-3-methylimidazolium chloride inside the clay structure. Conversely, the pillar improves the adoption capacity fluorescein due to its location inside interlayer space. Interestingly, the time resolved fluorescence show that the dye is not released in solution as it is the case for the pristine clay.

The electronic, magnetic and half-metallic predictions of Ga1-x TMxP (TM = Cr, V, and x = 0, 0.125 and 0.25) alloys

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Abstract: The electronic structure and magnetic properties of diluted Ga1−xTMxP (TM= Cr, V) in the cubic structure at concentrations x= 0, 0.125 and 0.25 were studied using the full-potential linearized augmented plane wave approximation of the density functional theory with the Wu-Cohen generalized gradient approximation (WC-GGA) and GGA plus Hubbard U parameter method. We found that the Hubbard U correction significantly improves the current DFT results. Features such as lattice constant, bulk modulus, spin-polarized band structures, total and local densities of states and magnetic properties have been computed. The electronic structure show that Ga1−xMTxP compounds are half-metallic ferromagnets with spin polarization of 100%. The calculated total magnetic moments for Ga1−xVxP show the integer value of 2μB per formula unit and Ga1−xCrxP exhibit a total magnetic moment of 3μB, which confirm the half-metallic behavior of these compounds.

Electrochemical reactivity of bipyridinecoordinated with chlorotriethylsilane

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Abstract: In this work we describe the study by means of cyclic voltammetry, of the complex of chlorotriethylsilane containing silicon hypercoordinated with 2,2'-bipyridine. Despite the expected similarities between carbon and silicon, they seem very different in general and this difference appears mainly in the ease with which carbon forms the weak coordination compounds (alkenes, alkynes) while those of silicon rather presenting coordinations higher exceeding 4 and reaching 5 and 6. These materials, known as "hyper-coordinated silicon compounds" have attracted particular attention from chemists over the past thirty (30) years [1]. The interest of these compounds results from their various reactivities thus opening new possibilities for the synthetic chemistry of silicon. Earlier attempts were made to obtain such species by a variety of methods, but were unsuccessful, until 1963 when West et al. [2] were able to prepare two compounds Ph3Si(bipy)I (I) with a light yellow color and a bromide Ph3Si(bipy)Br (II), a white solid, which dissociates in dichloromethane to produce the ion Ph3Si(bipy)+ stable with pentacoordinated silicon. We have shown by electron paramagnetic resonance (EPR) and cyclic voltammetry that it is possible to prepare, in CH3CN/Bu4NBF6 0.1M, a complex of a chlorosilane with 2,2'-bipyridine containing a silicon penta -coordinated and detect it by cyclic voltammetry. This complex is very sensitive to humidity in the air and may be stable in a truly anhydrous environment.

DFT and TD-DFT calculation of silafluoréne-based small molecules for organic solar cells

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Abstract: The Small molecules are advantageous as optoelectronic materials due to their HOMO-LUMO energy levels. silafluoréne compounds are also useful as photoconductors or charge transport materials. The Density Functional Theory (DFT) with the hybrid functional B3LYP were used to determine the electronic properties (Energy of HOMO and LUMO orbitals, gap energy, chemical potential, electronegativity ...). The optical properties (the excitation energy, the absorption wavelength (λ max), and the oscillator forces (f)) were obtained by the theory of the time-dependent density functional (TD-DFT).

Mixed Convection of Power-Law Fluid in Solar Collector with Two Lateral lids Moving Heated from Below

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Abstract: Mixed convection, such as that seen in a lid-driven cavity, can be found in various natural and industrial applications, including solar power collectors. The non-Newtonian fluid in the power-law model filled in the cavity is heated from below and cooled by the other lids. Numerical simulations of two-dimensional incompressible Navier-Stokes and energy equations for a non-Newtonian fluid in a square cavity with two lateral lids moving towards the bottom; on the other side, the lids driven in the opposite direction are studied. This research looked at the Nusselt number, temperature, pressure distribution, and streamline velocity. This research aims to determine how the increased power-law index affects the Nusselt number and how the lid-driven in the opposite direction influences the hydrodynamics of the fluid. This study has been conducted for certain parameters of Reynolds number 100, Richardson number 0.1, Prandtl number 0.7 and power-law index range. The grid resolution is based on for both directions; in order to solve the governing equations numerically, the finite volume method was used. For the convective terms of the momentum, a second-order upwind scheme was used and a central difference scheme for other terms. In addition, the coupled scheme was used to solve the pressure-velocity coupling. The predicted results show that the mixed convection is increased by increasing the power-law index, leading to a significant improvement in the Nusselt number; it is clear that this enhancement is more pronounced as the lids move in the opposite direction.

Ab-initio study of the structural, electronic and optical properties of III-V semi-conductors

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Abstract: Ab-initio calculations have been performed on the structural, electronic and optical properties of GaAs and YAs binary compounds by the Full Potential Linearized Augmented Plane Wave (FPLAPW) method. Based on the DFT implemented in the Wien2k code. The exchange-correlation potential (XC) has been treated by the generalized gradient approximation (GGA) and the local density approximation (LDA) to study the structural. We additionally used the Engel Vosko approximation (EV-GGA) and the (mBJ) approximation to determine the electronic properties. The study of the electronic structure of the compounds has been carried through the calculation of the band structure, total and partial electronic density of states diagrams (TDOS and PDOS). The results obtained for the lattice constant, bulk modulus, band gap, the dielectric functions, the refractive index, the absorption coefficient and the reflectivity are close to the experimental data.

The effect of temperature on the elaboration of thin films in nickel oxide

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Abstract: The structural, optical and electrical properties of nickel oxide produced by several temperatures. Using the spray pyrolysis deposition technique using a solar concentrator (furnace) fabricated in our laboratory. Thin films of (NiO)(T) were produced on glass substrates. The structure , optical and electrical properties of the different samples were studied. X-ray diffraction observations revealed that cubic crystals are created in all the films produced. These plans experienced peaks for the dominant plans, (the (200) plan). The grain sizes of our products vary between 18.15nm and 20.20nm, depending on the processing temperature. Our elaborate films present optical gap values which vary between 3.197ev and 3.319ev, in addition to the Urbach parameters which vary according to the temperature, between 348.27mev and 201.64mev. Finally, the elaborate films have electrical conductivity values of 0.2337 (ω.cm) -1 to 36 (ω.cm) -1 and electrical resistivity values of 21.15 (ω.cm) to 45.32 (ω .cm), depending on the temperature.

Synthesis and characterization of Cerium Oxide CeO2 nanoparticles.

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Abstract: The development and use of nanoscale materials are one of the major concerns in 21st-century technology. It is in this context that our study on the synthesis and characterization of a material of the type "nanoparticles ", in this case, the cerium dioxide (or "Ceria" CeO2) was synthesized by a sol-gel non-aqueous method. The obtained samples were characterized by various structural and morphological processes. These new nanoparticles were elaborated with the aim of obtaining the best possible physicochemical properties allowing them to be applied in many fields, including environmental protection and the Elimination of organic pollutants in water.

Study of the structural, electronic and mechanical properties of novel Zintl compound SrGa2P2

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Abstract: Our attention has turned to Zintl compounds because of their recent emergence as a promising materials due to their rich chemistry and structural complexity1,2. In this work, we investigated the structural, electronic and mechanical properties, formation energy and cleavage energy of novel Zintl compound SrGa2P2 (strontium Gallium phosphide), using self-consistent density-functional calculations implemented with soft ab initio pseudopotentials3. We found that this compound is an indirect-gap semiconductor with a narrow band gap of 0.28 eV. The mechanical properties of SrGa2P2 have been examined by calculating all independent single crystal elastic constants Cij using the static finite strain technique, and average mechanical properties of bulk polycrystal elastic moduli, namely bulk modulus, Young's modulus, shear modulus, and Poisson's Ratio, via the Voigt–Reuss–Hill approximations. We have verified that this compound is mechanically stable through elastic stability criteria. Its formation energy is -0.73 eV, since the formation energy is low, it will be easy to form this compound. Furthermore, the cleavage energy of a monolayer from a multilayer bulk material, indicates that it is possible to obtain atomic layer sheets from multilayer bulk material. These results indicate that the novel Zintl compound SrGa2P2 could be a promising candidate for its narrow band gap and stability.

First-principles calculations on the origins of the optical band gap bowing of zinc blend GaAs1-xNx alloys

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Abstract: Based on the full potential linear muffin-tin orbitals (FPLMTO) calculation within density functional theory, we systematically investigate of the structural properties and optical band gap bowing of zinc blende GaAs1-xNx alloys. The ground-state properties are determined for the bulk materials (GaAs and GaN) as well as for the different concentration (x=0.125, x=0.083 and x=0.063) of their alloys. Deviations of the lattice constants from Vegard's law and the bulk modulus from linear concentration dependence (LCD) were observed. The microscopic origins of the gap bowing were explained by using the approach of Ferhat and co-workers. The gap bowing for the alloy of interest was found to be mainly caused by the volume deformation (VD) contributions.

Theoretical investigation of optoelectronic properties of (InN)/(GaN)n superlattices

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Abstract: Based on the full potential linear muffin-tin orbitals (FPLMTO) calculation within density functional theory, we systematically investigate the electronic and optical properties of (100) and (110)-oriented (InN)/(GaN)n zinc-blende superlattice with one InN monolayer and with different numbers of GaN monolayers. Specifically, the electronic band structure calculations and their related features, like the absorption coefficient and refractive index of these systems are computed over a wide photon energy scale up to 20 eV. The effect of periodicity layer numbers n on the band gaps and the optical activity of (InN)/(GaN)n SLs in the both growth axis (001) and (110) are examined and compared. Because of prospective optical aspects of (InN)/(GaN)n such as light-emitting applications, this theoretical study can help the experimental measurements.

Report of process parameters and the mechanical behavior of sheets welded by the fsw process.

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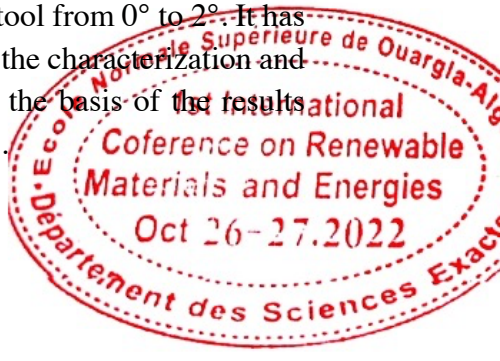
Abstract: This research study points to one of the welding processes in particular the friction stir process (FSW). The study carried out accumulates on the relation between the parameters of the process (speed of advance and that of rotation of the tool, holding time) and the mechanical characteristics of the sheets of aluminum alloy 3003 of two (02) millimeters of thickness placed end to end and welded at 90° and 45°. The welds were made by varying the speed of rotation (1000.2000 rpm) and by fixing the advance of the tool at 500 mm/min. This experimental approach is also based on the variation of the inclination of the welding tool from 0° to 2°. It has thus been shown that the weighted parameters play an important role for the characterization and optimization of the aforementioned weld joints. Consequently, and on the basis of the results obtained, the use of the 90° joint remains the best strength point of view.



First-principles calculations of structural, elastic, electronic, and optical properties of Na3BrO

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Abstract: In this work, we have calculated the structural, elastic electronic, and optical properties of Na3BrO compound with the full potential linearesed augmented plane waves method FP_LAPW based on the density functional theory (DFT) as implemented in the code wien2k. To deal with the exchange and correlation potential, we use the generalized gradient approximation (GGA_PBE), the generalized gradient approximation (GGA_PBEsol) and the local density approximation LDA for the structural and elastic properties. For the optical and electronic properties, the GGA-PBEsol approximation is used. The obtained lattice parameters are in good agreement with the excremental and theoretical data found in the literature. The calculated elastic constants verify the mechanical stability conditions in the cubic structure and indicate the anisotropy nature of the studied material. On the other hand, the electronic property calculations show that Na3BrO is a semiconductor. The found results are compared to the experimental data and other theoretical calculations.

Ab Initio Investigation of Structural,Electronic, Elastic and Mechanical Properties of Half-Heusler Alloys

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Abstract: One important class of materials suitable for spintronic devices applications is some of the Half-Heusler compounds .

Using the full-potential linearized plane wave method (FP-LAPW), we study the structural, electronic and mechanical properties of HfNiSn . The electronic exchange correlations energy is described by generalized gradient approximation (GGA) with Perdue-Burke-Ernzerhof (PBE) exchange-correlation functional. Ground state properties such as the equilibrium lattice constant, bulk modulus and its pressure derivative were calculated and compared with experimental data.

Structural and microstructural study of degraded solar panels

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Abstract: In recent years, scientists and researchers have focused on the renewable energies of all kinds, especially solar energy. adrar is considered among the best regions in the world that have the appropriate conditions for solar energy production, but the solar panels are exposed to damage with time by the influence of external factors, and this causes a deterioration (degradation) in the level of energy production. during this research, we will focus on the structural and microstructural causes, of the degradation types, that affect the components of solar panels. Methods used: in this study, we separated the components of the sample carefully. our study is divided into two parts; the first part, deals with the analysis of the panel's components by x-ray diffraction and its study by the Xpert HighScor software, and the second part is concerned with describing the electrical properties (electrical resistivity) of photovoltaic panels pursuant to various temperatures.

Structural and electronic properties of a rare earth dihydride LaH2

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Abstract: We have performed ab initio calculations of electronic structure and equilibrium properties for the rare earth dihydride LaH2 using the full-potential linearized augmented plane wave method (FP-LAPW) approach within the density functional theory (DFT) in the generalized gradient approximation (GGA) and local density approximation (LDA) as implemented in the WIEN2k simulation code at 0K. The equilibrium properties have been determined, the density of states, electronic density, the energy band structures and thermodynamic properties are studied in details. It was concluded that the GGA optimized lattice parameter agrees much better with the experimental findings than the LDA one. Two low-lying hydrogen-metal bands of LaH2 were observed. The Fermi energy EF falls at a level where most of the states are rare-earth 5d conduction states. We obtain information on the negligible role of the H 1s state contribution near EF.

Kinetics of reactivation of phosphorus in hydrogenated silicon based Schottky diodes during thermal annealing

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Abstract: The most widely used technology for photovoltaic conversion today is that of crystalline silicon solar cells. These solar cells are made from highly purified silicon wafers. In order to continue and accelerate the cost reductions of a photovoltaic system, it is necessary to conduct research in order to make a technological leap that can remedy the high cost of solar panels. The main objective of this work is to study the kinetics of phosphorus reactivation in Schottky diodes based on hydrogenated silicon during thermal annealing through the analysis of the doping profile under the effect of various experimental parameters [1-3]. Firstly, the microwave plasma power, initial phosphorus concentration in the samples and hydrogen flux were fixed as 650 W, 1015 cm–3, and 30 sccm, respectively, to investigate the behavior of different working parameters, specifically the duration and temperature of hydrogenation. Secondly, few samples hydrogenated at 400 °C for 1 h were annealed under the forming gas (10% H2 + 90% N2) within the temperature range from 100 to 700 °C for 1 h. The obtained results depict the hydrogenation temperature reveals quite complex phosphorus deactivation rates. The hydrogenation time tH confirms the results obtained by varying the temperature where at 250°C a remarkable diffusion in volume of silicon with a high neutralization rate was observed. The thermal annealing in a forming gas indicates the increase in passivation rate of phosphorus as a function of annealing temperature, till the passivation rate attains saturation in the sample annealed at 400 °C.

Influence of Bi Doping on Structural and Optical Properties of ZnO

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Abstrac: Oxide of nano particle size in nanometer range have been paid more attention for their unique properties ; in present work influence of Bi dopant on structural and optical

properties of ZnO nanoparticle were presented. Bismuth doped Zinc oxide nanopowder with doping concentration between 0 and 6% mol successfully synthesized with a soft chemistry method: the sol-gel rout. The studies on the crystal structure of ZnO nanopowders were carried out using the X-ray diffractometer (XRD), and the optical absorbance spectra was measured using a UV–VIS double beam spectrophotometer. The structural characterization was carried out by the X-ray diffraction technique, which showed that the synthesized powders of pure and Bi-doped, from the sol-gel method, crystallize in a hexagonal würtzite structure with average grain size varying between 19 nm to 12 mn. Analysis of the transmittance spectra allowed us to determine the optical gaps for these pure and doped powders. Finally, the obtained material has been used to prepare varistors.

A combined experimental and DFT approach of a new organic material

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Abstract: Using experimental FTIR, UV-Vis, 1H, and 13C NMR techniques, the spectroscopic characterization of the newly synthesized heterocyclic aromatic organic compound (Z)-3-N-(ethyl)-2-N'- ((3-methoxyphenyl)imino)thiazolidine-4-one (abbreviated by Z-EMIT) was completed. Theoretical computations on C12H14N2O2S utilizing the DFT method linked to the B3LYP and BPVB functional with the basis set of 6- 311G (d, p) were carried out to support the analytical results. Additionally, the research of frontier molecular orbitals (FMO) analyses, HOMO-LUMO energies, density of state (DOS), NBO analysis, molecular electrostatic potential (MEP), and global and local chemical reactivity descriptors was used to examine the reactivity of the title molecule. Similarly, the initial hyperpolarizability of the investigated chemical was computed to highlight its NLO activity. Finally, the biological activity of C12H14N2O2S was investigated and discussed using molecular docking.

Stability and hydrogen storage on pristine two dimension material Si3N : Ab initio study

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Abstract: Hydrogen is a clean energy with high efficiency, but the problem of storage still prevents its extensive use. Two-dimensional (2D) materials can be regarded as potential hydrogen storage applications due to their excellent characters, including excellent structural and chemical stability, superior electrical conductivity and large active surface area. Here first-principles calculations are carried out to investigate the structural, electronic, mechanical, thermodynamic properties and adsorption behaviors of hydrogen molecules on pristine Si3N monolayer based on the Density Functional Theory (DFT) using Vienna Ab initio Package (VASP). Our results reveals that Si3N single layer has metallic character with GGA-PBE approximation. Furthermore, The calculated mechanical and thermodynamic properties reveal that this monolayer is mechanically and dynamically stable. Moreover, The plausible adsorption sites on top of silicon atom (TSi), on top of nitrogen atom (TN), the bridge site (B) and the hollow site (H) are considered. We found that the most favorable site of H2 molecule on pristine Si3N monolayer is the bridge site with adsorption energy of (Ead = 0.068 eV). This study provides outstanding results, highlighting the bright viewpoints for the decoration of pristine Si3N with other elements for high-capacity hydrogen storage.

DFT Study of structural, electronic, elastic and Optical properties of BAs and BP binary compounds

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Abstract: This work relates to the study of the structural, electronic, elastic and optical properties of binary compounds BAs and BP using the Full Potential Linearized Augmented Plane Wave Approach (FP-LAPW), based on the theory of density functional theory (DFT) implemented in the Wien2K code. The ground state structural properties such as the lattice constant, bulk modulus are in good agreement with other theoretical and experimental calculations. The obtained results for the band structure and the density of states (DOS) shows that the compounds BAs and BP have an indirect gap ($\Gamma \rightarrow \Delta$). The elastic study is considered to determine the elastic moduli C11, C12, and C44 of the cubic crystal. Through the obtained results of the elastic moduli, the derivative mechanical moduli including bulk modulus B , shear modulus G , ratio B/G, Young's modulus Y, shear wave modulus Cs, Poisson's ratio ν, Kleinman parameter ζ, and anisotropy factor A are calculated in the fact to demonstrate the mechanical stability of these compounds. We have also analyzed the optical properties (dielectric function, refractive index, reflectivity and optical conductivity).

Increasing the efficiency of solar panels by using two-dimensional graphene lenses.

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Abstract: We want to improve the performance of solar panels by coating them with a layer of graphene lenses. The modeling and simulation process achieved good results, and the importance of this work was demonstrated by its application in non-desert areas and in a variety of weather conditions.

Storage and recovery of solar energy collected by the Parabolic Trough Collector

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Abstract: In this paper, an experimental study of the latent thermal storage by the solar Parabolic Trough Collector (PTC) was carried out using phase-changing materials MCP in the state of Ouargla on different days, where the solar radiation is concentrated by the PTC, where the absorbed heat is transmitted at the level of the absorption tube to the water, which in turn absorbs from the tip of the paraffin wax. A phase change (solid-liquid) occurs at the melting temperature of the paraffin used in this study. Then the temperature of the paraffin rises, and this process continues from sunrise to sunset. And at sunset, the paraffin releases the heat it has absorbed during the insolation period, as this heat is used to heat water for various domestic uses. Experimental results in this work showed that latent storage systems using paraffin could recover and use thermal energy for up to 11 hours

Experimental analysis and modelisation the degradation of concrete elements.

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Abstract: The durability of a structure depends on many parameters including the quality of the designs. The principal applications of ndt methods are likely to be quality control of the concrete conditions, while in old structures; the methods are expected to provide needed feedback on concrete conditions. [1]. Generally, damaging of concrete structure comprises two successive stages [2]; the first named a latent stage which corresponds to this low concrete damage, without any visible effects yet. The second named a propagation stage of the material damages. Damages are now visible. Considerable research [3, 4, 5, 6]. In this work we are interesting to experimental analysis of concrete element's degradation under mechano-hygrothermaleffect. Prismatic specimens 7x7x28 cm3 are used. For detecting damages in concrete element, we use ultrasonic testing

A two-dimensional numerical study of turbulent nanofluid (Iron oxide-water) flow under a magnetic field.

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Abstract: Computational fluid dynamics (CFD) tool is used to study numerically a nanofluid mixture of water and Fe3O4 with MHD effect. The simulation is performed in order to determine the turbulence forced convection heat transfer in a circular tube. This is implemented by using the single and two phase mixture approaches with assumption that the particles are spherical and diameter equal to 36 nm. The simulation output data compared with an experimental literature data from other study and found matching. The result shows that Nu and friction factor at fixed Reynolds number is proportional to the magnetic field.

Increasing the effectiveness of solar panels by using 2D materials.

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Abstract: We want to improve the performance of the solar panels by coating them with a layer of 2D lenses. The modeling and simulation approach produced successful results, and the significance of this work is seen in its possible use in non-desert regions with little sunshine exposure..

Mechanical Characterization of Thin Films in CrN, Deposited by Magnetron Spraying on XC42 Steel.

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Abstract: The objective of this work is to study the effect of chromium nitride layers deposited by the DC reactive magnetron sputtering technique on the mechanical behaviour of a carbon steel of type XC42, previously subjected to a complete quenching process carried out at 850 °C followed by a tempering at 550°C. Prior to the deposition process, all samples were mechanically polished to a mirror surface. The chromium nitride thin films were deposited at a temperature of 400°C for 120 min using a nitrogen/argon gas mixture. The morphology as well as the surface topography was determined by scanning electron microscopy (SEM) and atomic force microscopy (AFM) respectively. The adhesion of the chromium nitride layers was evaluated by scratch tests. The results showed that under a normal load of 40N applied gradually, linear cracking occurs at a load of 16N until the CrN layer fails at a load of 21N.

Design of sizing the renewable energies into microgrid system

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Abstract: The microgrid is an application of a renewable resource system (solar, wind, hydroelectric, etc.) That is connected to the grid or off-grid for producing electricity, with the purpose of achieving sustainable development. This enhances power supply system dependability, efficiency, and security. The economic sizing of various resources, such as costs, revenues, and energy produced, this work proposes a design for estimating various resources depending on the characteristics of the installation site, such as energy deposit and meteorological conditions, in order to compute the project's minimum cost and profits using an optimization algorithm. The energy cost is reduced by adjusting the size of the microgrid's operation. When sizing the system, it is critical to understand how the microgrid operates. Then an optimal cost is calculated using an optimization algorithm for identifying the best capital cost, the best annual cost of operation and maintenance, and the replacement cost, the optimal sizing is found to be the lowest energy cost and may be subject to technical and environmental constraints. As a result, the load demand is fulfilled. Economic analysis is a useful technique for assessing and estimating the performance of microgrid operations.

Optimisation of the intrinsic passivation layers in HIT solar cells.

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Abstract: Heterojunction with Intrinsic Thin layer devices (HIT) have a great potential to reduce the cost of production and to enhance the efficiency of solar cells. In this work, we have used the SCAPS-1D simulator to study the effect of the passivation layer parameters on the performance of a HIT c-Si solar cell having the following structure: Indium Tin Oxide (ITO) / hydrogenated n-doped amorphous silicon (p-a-Si:H) / hydrogenated intrinsic amorphous silicon (i-a-Si:H) / p-doped crystalline silicon (p-c-Si) / Aluminum (Al). We concluded that the most efficient material used as a passivation layer is the weakly hydrogenated amorphous silicon with a gap energy of 1.6 eV. With higher gaps, a significant potential barrier is generated in the valence band at the i-a-Si:H/n-c-Si interface with a height of about 0.65 eV, which blocks the holes collection by the front contact of the cell and thus increases the recombination rate in the device. The obtained J-V characteristic shows that for a small intrinsic layer thickness, a high electric field is observed at the p-a-Si:H/n-c-Si, junction and consequently, a better separation of the photogenerated charge carriers is obtained, thus causing a drop in the recombination rate and an improvement of the cell performance. An optimal thickness of 3 nm is needed to achieve an efficiency of 20.08%.

Dye degradation by Fenton like processes using hydroxyapatite catalysts

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Abstract: Fenton reaction derived by the redox cycle of Fe2+/Fe3+ to generate •OH via the activation of H2O2, is one of the most promising techniques of advanced oxidation process (AOPs), owing to the high redox potential of the •OH radicals and its non-selectivity nature. However, the Fenton process presents some limitations such as the requirement of strict pH control ($3 < pH < 4$), and difficulties in the recycling of the homogeneous catalyst leading to high operating costs. These unresolved problems drive to develop more active and robust Fenton catalysts with advanced strategies.

In this work our attention was focused on the metalphosphates catalysts in particular on Hydroxyapatite (HA). The HA was synthesized and characterized by X-ray diffraction (XRD), Fourier transform infrared spectroscopy (FTIR) and scanning electron microscopy (SEM). The compound was used as a catalyst in a heterogeneous Fenton-like process for the elimination of methyl violet dye, a cationic textile dye. The degradation process has been studied on different experimental conditions and it reveals that at room temperature and neutral initial pH, a total removal was obtained within 120 min with HA dose of 2.5 g L-1, H2O2 of 36 mmol L-1 and initial dye concentration of 20 mg L-1.

Plasma Study into Nitrogen Ambience for AlN Pulsed Laser Deposition

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Abstract: Laser-induced plasma from an aluminum nitride (AlN) target into vacuum and nitrogen ambience has been investigated by means of time-integrated optical emission spectroscopy (OES). Q-switched Nd-YAG has been used to create AlN plasma at different laser fluences. The emission spectra recorded in vacuum are dominated by neutral and ionized aluminum emission lines from Al, Al+ and Al++ species, while emission from atomic nitrogen species were weakly observed. The presence of nitrogen gas gives rise to all the plasma species emission. Thereby, neutral and ionized nitrogen species, N, N+ and N++, were observed. Also, in nitrogen gas, the dominant molecular species are found to be N2 and N2+ at different sequences. To jointly study the effect of nitrogen gas pressure and laser fluence on the evolution of plasma composition, space resolved emission of AlN plasma species has been employed. Contrary to plasma emission in vacuum which showed a rapid vanishing, plasma emission in nitrogen gas was maintained within a distance range that depends on the pressure and laser fluence. This effect concerns Al and N elements. Our results are of particular interest in view of selecting the optimal regime of AlN target ablation and plasma composition-emission affected by laser fluence and nitrogen gas pressure for the deposition of AlN thin films.

Ab-initio study of the structural, electronic and optical properties of III-V semi-conductors

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Abstract: Ab-initio calculations have been performed on the structural, electronic and optical properties of GaAs and YAs binary compounds by the Full Potential Linearized Augmented Plane Wave (FPLAPW) method. Based on the DFT implemented in the Wien2k code. The exchange-correlation potential (XC) has been treated by the generalized gradient approximation (GGA) and the local density approximation (LDA) to study the structural. We additionally used the Engel Vosko approximation (EV-GGA) and the (mBJ) approximation to determine the electronic properties. The study of the electronic structure of the compounds has been carried through the calculation of the band structure, total and partial electronic density of states diagrams (TDOS and PDOS). The results obtained for the lattice constant, bulk modulus, band gap, the dielectric functions, the refractive index, the absorption coefficient and the reflectivity are close to the experimental data.

DFT study of the structural, electronic and optical properties of BaSe, BaTe, YN and Ybi

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Abstract: The subject of This work inclues the study of structural, electronic and Optical properties of binary compounds BaSe, BaTe, YN and YBi by the augmented and linearized plane wave method (FP-LAPW), based on the density functional theory (DFT) implemented in the Wien2K code. We have used the generalized gradient approximation (GGA) for the term of the potential for exchange and correlation (XC) to study the structural properties and optical properties. The structurals properties such as the lattice constant and bulk modulus are in good agreement with the theoretical and experiment results available.The obtained results for the band structure and the density of states (DOS) show that the compounds BaSe, BaTe and YBi have an indirect gap (Γ→X) but YN have an direct gap. In addition, the use of the modified Beck Jonhson (mBJ) potentials as a correction of the terms of exchange and correlation allowed us to have energy gaps in good agreement with the experimental results.This results show a significant improvement over other theoretical work. The resultats obtained for the dielectric functions, the refractive index, the absorption coefficient and the reflectivity are close to the experimental data.

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Numerical simulation and analysis of Cu2ZnSnS4 solar cells performance using various buffer layers

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Abstract: CZTS (Cooper Zinc Tin Sulfide: Cu2ZnSnS4) cells have gained prominence among solar technologies since they are composed of available, non-toxic materials and have a lower manufacturing cost. In this work, a numerical simulation and analysis of Cu2ZnSnS4 solar cells are carried out in order to study the effect of various buffer layers on cell performance. For this purpose, the Solar Cell Capacitance Simulator program (SCAPS-1D) is used. The cell structure is based on Cu2ZnSnS4 as absorber layer, ZnO as window layer and a buffer layer (CdS, ZnSe, In2S3). Simulations results show that the buffer layer based on In2S3 has the highest conversion efficiency for Cu2ZnSnS4 solar cell (with JSC = 26.2703 mA/cm2 , VCO = 1.2357 V, FF = 73.8096%, and η = 23.9606%). The effect of temperature on the efficiency of the best structure (ZnO/In2S3/Cu2ZnSnS4) has also been analyzed (we found that 298K was the optimum temperature.). The findings of these simulations are expected to serve as useful guidelines for developing more efficient CZTS solar cells.

Modeling and Simulation of Cu (In1−xGax) Se2 tandem thin-film solar cells

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Abstract: The potential of designing a tandem solar cell based copper indium gallium diselenide Cu(In1−xGax)Se2 is investigated in this study. The two-dimensional Silvaco Atlas software is used under standard Illumination (AM1.5G). In order to increase the conversion efficiency, the usual single CIGS solar cell (x=0.3) is used as the bottom cell and another single CIGS solar cell (x=0.94: i.e. with traces of indium) is used as the top cell in the tandem configuration. The simulated photovoltaic parameters of this CIGS/CIGS tandem cell are: a short-circuit current density Jsc of 18.76 mA/cm2, an open-circuit voltage Voc of 1.88 V, a fill factor FF of 77.68 %, and the conversion efficiency η of 27.52%. These best values and the highest efficiency are obtained for CIGS thickness of the top and bottom cells corresponding of 0.18 μm and 3.5 μm, respectively, while the band gaps were 1.71 eV for the top cell and 1.27 eV for the bottom cell. These results are showed that the molar fraction x of the CIGS absorbing layer and their thickness are key parameters to optimize the performance of the CIGS/CIGS tandem solar cell. This approach can be used also as a basis to produce a tandem CIGS cell with record efficiency.

Optimization of CdS buffer layer for high efficiency CZTS solar cells

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Abstract: Copper Zinc Tin sulfide (CZTS) thin film solar cell achieved a great attention of researchers due to its direct bandgap. In this work, we have used one-dimensional Solar Cell Capacitance Simulator (SCAPS-1D) to investigate and design the Mo/MoS2/CZTS/CdS/ZnO/Al device. An optimization of different physical parameters (thickness and doping concentration) of CdS buffer layer has been done. A negative effect on cell performance has been observed by increasing the thickness of buffer layer (CdS) due to the distance that the minority carrier (holes) needs to travel increases with the film thickness. Moreover, the electric field strength at CdS/CZTS junction and the recombination rate increase as the doping concentration increases. From these analyses, the optimum conversion efficiency of CZTS based PV cell has been found to be around 17.8 % by optimizing the CdS buffer layer.

Elaboration of Low Dimensional Cu-PbS-Si Structures for Sunlight Harvesting

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Abstract: Since opting for solar energy as an alternative energy source, harness sunlight has become the need of the hour. The solar spectrum has an energy distribution of nearly 38.9% and 54.3% in the visible and NIR, respectively at the earth's surface. The quest for materials for harvesting these two ranges of light leads to the integration of multicomponent with tailored properties to elaborate composite or heterostructure for various applications such as photosynthesis. Low dimensional metal-semiconductor structures could be used to develop efficient photoelectrodes for the photocatalysis process. Lead sulfide (PbS) and Silicon (Si) are two semiconductors with noteworthy optical properties. The association of these two materials allows the obtaining of heterostructures with an interesting optical synergy. In this work, we investigated a combined photochemical and chemical bath deposition strategy to synthesize Cu-PbS thin films, as co-catalyst and photocatalysts respectively, on various porous silicon substrates (PSi) in order to fabricate photoelectrodes for solar-driven electrochemical conversion. The elaborated Cu-PbS-PSi heterostructures were characterized by scanning electron microscopy (SEM), UV visible NIR spectroscopy, and linear sweep voltammetry (LSV). The reflectivity property revealed that an important gain in photon absorption of the elaborated structures was noticed. The PEC properties confirmed that the low dimensional Cu-PbS-PSi structures enhanced significantly the catalytic performances of their relative photoelectrodes.

First-principles calculations to investigate the structural, mechanical and thermodynamic properties of the cubic perovskite abo3

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Abstract: The abo3 perovskite-type oxides, where a is a monovalent or divalent cation, b is penta- or tetravalent transition metal atom and o is oxygen, display a wide range of interesting electrical and optical properties and therefore have wide applications in the manufacture of electronic and optoelectronic devices such as various sensors, electro-optic modulators, infrafed detectors, catalytic activity, optical waveguides in various applications. Strontium titanate is a typical perovskite dielectric with a wide range of technological applications. Because of its special properties related to ferroelectricity, semiconductivity, superconductivity and catalytic activity, it has been extensively studied over the past several years. In the present contribution, the structural, elastic of the srtio3 crystals in the cubic (pm3m) phase were calculated by the first-principles calculations using the plane wave pseudopotential calculations (pp-pw) implemented in the abinit package within density functional theory and the generalized gradient approximation based on the perdew–burke–ernzerhof (pbe-gga) functional. The thermodynamic properties have been investigated by using the gibbs program which is based on the quasi-harmonic model of debye. The structural parameters (lattice constant, bulk modulus), mechanical (elastic constant, young's modulus, shear modulus and poisson's ratio), thermodynamic properties (the variation of the volume, bulk modulus and thermal expansion coefficient, heat capacity at constant volume cv, heat capacity at constant pressure cp and entropy) as function of temperature of the srtio3 cubic phase, are studied. The results of our simulations are discussed and compared with experimental and theoretical results available.

Mn Doped ZnO Piezoelectric Thin Films for SAW Applications

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Abstract: In this research paper; Sol-gel Dip-coating pure and manganese doped Zinc Oxide Mn (2% wt): ZnO piezoelectric thin films were elaborated on Silica (Si) substrate at 500°C annealing temperature. The effect of manganese source (Manganese Acetate and Manganese Chloride) on structural and mechanical properties of Mn: ZnO thin film is reported. The measured film thickness was about 300nm. The XRD patterns shown that; all pure and Mn: ZnO piezoelectric thin films have a wurtzite structure of preferential orientation on the (002) plane. Maximum crystallite size was found larger for manganese Acetate source. Hardness and Young's modulus obtained from nanoindentation tests indicted that smallest hardness appears for Acetate Mn doped ZnO which lead to the best plastic resistance to permanent damage. These results make the highest interest useful of Acetate Mn doped ZnO piezoelectric thin films for Surface acoustic waves (SAW) devices.

Influence of the modification of an Algerian clay on the adsorption of a heavy metal

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Abstract: This work concerns an experimental study of Fe(II) adsorption on a clay sample from the Maghnia region. The bentonite used was modified by the surfactant Dodecyl Sodium Sulfate (SDS), it is then a question of modifying this clay to three types of modified bentonite (BM1, BM2, BM3) of different masses of SDS. In this study, we investigated the adsorption power of iron on raw and modified bentonite.

A maximum adsorbed amount 73.11 mg/g is obtained with BM1 and the kinetics follow the pseudo second order pattern. On the other hand, the Langmuir and Freundlich models simulate the adsorption isotherm of iron.

Comparison between both Commands Photovoltaic MPPT of the system: algorithm IncCond and FLC

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Abstract: Photovoltaic systems have gained extraordinary popularity in the power generation industry. Despite the advantages, photovoltaic systems still suffer from the main disadvantages, including low conversion efficiency, and non-linearity of the output power of the photovoltaic system. To overcome these problems, various optimization and control techniques have been proposed. However, traditional solutions for MPPT controllers such as the Incremental conductance (Inc-cond) method, which presents oscillation problems around the operating point; the reason why improving the results obtained with these algorithms has become an important goal for researchers to achieve. This study presents the design and comparison between two controllers (IncCond and an artificial controller with fuzzy logic) to track the maximum power point of a PV system their performance is evaluated using the simulation tool (Mtlab-Simulink). We give an overview of how artificial intelligence techniques (IA) can add value to photovoltaic systems.

Optimizing Nanofluids Heat Exchanges in the Parabolic-Through Collectors Solar Receiver

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Abstract: The present paper concerns a numerical study of heat transfer during a permanent and steady laminar flow through the absorber of the parabolic-through collector, a smooth tube absorber of 3m long and two different diameters. The aim of this study is to optimize the heat exchange within the solar receiver using the Fluent software. The calculations are carried out for a new generation of heat transfer fluids, the nanofluids, where we consider the synthetic oil as a base f luid and different nanoparticles: AL2O3 (Alumina) and Cu (Copper). For that, we used the f inite volume method to discretize the partial differential equations governing the flow (the equation of continuity, momentum and energy). The dynamic and thermal fields are obtained for different volume fractions of nanoparticles (5%, and 10%). The analysis of the nanofluids thermophysical properties, the temperature evolution and the rate of heat transfer improvement were performed. The obtained results showed that the heat transfer enhanced as the nanoparticles concentration increased. Consequently, we deduced that the nanofluid allowing better heat transfer is the metallic nanofluid Copper Cu followed by the Alumina, AL2O3.

The effect of Ni doping on the optical and electrical properties of nanomaterial SnO2 :Ni thin films for optoelectronic applications

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Abstract: In the present work, we have synthesized nanomaterial undoped SnO2 and nickel doped tin oxide (SnO2 :Ni) thin films with various concentrations (1, 3 and 4 at. %), by sol gel spin coating method and deposited on glass substrates. The influences of Ni doping on structural, optical and electrical properties of SnO2 thin films were studied by x-ray diffraction (XRD), UV-Visible spectroscopy, photoluminescence spectroscopy and four-probe point measurements. The XRD analyses confirmed that undoped SnO2 was polycrystalline with tetragonal rutile structure. The optical studies revealed that all the films exhibited high transmittance varies between 75 and 90% in visible and near infrared regions and the band gap was found in the range 3.81-3.835 eV. Room temperature photoluminescence (PL) spectra showed a violet, blue and green emissions for all the films, which attributed to the different luminescent centers such as oxygen vacancies, VO0, VO+ and VO++, and interstitial tin Sni. Furthermore, all the films have low electrical resistivity varying between 3.14.10-3 and 25.5.10-2 Ω.cm. Thereby, our experimental data may be promising for applications in the field of nanotechnology such as on optoelectronic applications

Structural and Electrical Properties of CZTS Films for Solar Cell Applications: Effect of Thin Film Thickness

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Abstract: In this research paper; sprayed Cu2ZnSnS4 (CZTS) semiconductor thin films were elaborated on glass substrates at 350°C fixed temperature. The effect of different film thickness (317-1118nm) on structural and electrical properties of CZTS thin film is reported. The film thickness was varied by changing the flaw rate solution. The XRD patterns shown that the CZTS films have a kesterite structure of preferential orientation on the (112) plane with the presence of secondary phases of CuxS, Sn2S3 and Cu2SnS3 at 908nm film thickness. The electrical conductivity measurements indicate that CZTS films with 763 nm thickness have the best electrical conductivity value of 2.73 (Ω.cm)-1. These results make the highest interest useful of CZTS semiconductor thin films in solar cell applications.

A shear deformation model for free vibration behaviour of functionally graded nanobeams in thermal environment

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Abstract: In this paper, thermal vibration behavior of functionally graded (FGM) nanobeams exposed to various kinds of thermal loading are investigated based on new shear deformation beam theory which considers the influence of shear deformation without the need to shear correction factors. The theory accounts for new trigonometric distribution of the transverse shear strains and satisfies the zero traction boundary conditions on the surfaces of the beam. Material properties of FG nanobeam are supposed to be temperature-dependent and vary gradually along the thickness according to the power law distribution. The influence of small scale is captured based on nonlocal elasticity theory of Eringen. Based on the present higher order shear deformation beam theory, the equations of motion are derived from Hamilton's principle. It can be concluded that the present theory is not only accurate but also simple in predicting the thermal vibration behavior of functionally graded beams.

Theoretical Study Of Semi-Conductor Alloys

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Abstract: This work studies the structural and electronic properties of materials MgS and MgTe in the phase zinc blend. The calculations in this study are performed based on using the Density Functional Theory (DFT) by using the Full Potential Linearized Augmented Plane Wave method (FP-LAPW),the exchange and correlation potential is described in the Gradient Generalized (GGA) and the Tran-Blaha Modified Becke-Johnson(TB-mbJ) Approximation techniques implemented in WIEN2k[1] code. The two binaries are non magnetics with direct band gaps.These latters can constitute alloys which are ideal for optoelectronic and spintronic applications.

Application of the refined shear deformation Hamilton approach to the nonlinear buckling and free vibrations analysis of FGM nanobeams

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Abstract: In this study, the mechanical buckling and free vibration analysis of the nanobeams made of functionally graded materials in the framework of nonlocal strain gradient theory in conjunction with a refined higher order shear deformation beam model. The material composition of the FG nanobeam is assumed to vary continuously in the longitudinal direction based on a power-law model distribution. The small scale effect is taken into consideration based on nonlocal elasticity theory of Eringen. Hamilton's principle is applied to obtain the governing differential equation of motion and boundary conditions and they are solved applying analytical solution of buckling load, and natural frequency are presented for a simply supported beam, and the obtained results compare well with those predicted by the nonlocal Timoshenko and Reddy beam theories.

A numerical simulation study on the effect of heat transfer by convection on the performance of a volumetric tubular receiver in CSP.

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Abstract: This paper it includes a numerical simulation study of two-dimensional heat transfer in a tubular volumetric receiver in Solar power concentration systems, the geometric under consideration is Serpentine pipe, heated through a solar thermal radiation. This numerical simulation is done to optimize the performance of the receiver by making maximum thermal change between the solid (wall of serpentine tube) and the heat transfer fluid and this through different aspects (heat transfer fluid, heat flow, flow regimes). In the commercial software, CFD-Fluent the numerical method of finite volumes with first-order spatial discretization is used to solve the conservation equations of mass, and conservation of momentum and energy. The resolution of the systems of equations of discretization of the fields of speed, pressure and temperature follows the SIMPLE algorithm. The results are Show in this simulation by highlighting on the difference in the Heat transfer fluid temperature between the entrance and exit.

Physical properties of full and half Heusler alloys Co2CrAl and CoCrSb. First principal study.

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Abstract: Ferromagnetism and other related properties in Co-based Heusler alloys (Co2CrAl, CoCrSb), Full and Half have been investigated theoretically, by ab initio approach, based on the density functional theory (DFT), implemented in CASTEP code[1]. The Perdew-Burke-Ernzernof parametrization of the generalized gradient approximation (PBE-GGA) was used to account for the exchange–correlation energies in all the calculations[2]. Using first-principles calculations, several properties as: structural, electronic, magnetic, elastics and thermodynamics, were investigating for Co2CrAl and CoCrSb. The calculation of two energies, cohesive and formation are negative and confirmed the stability of our compounds, for Co2CrAl the cohesive and formation energies are respectively: –31.24 eV and 1.59 eV, for CoCrSb the cohesive and formation energies are respectively: -76.11 eV and 65.55 eV. As results of properties calculations, they exhibit a half mettalicity and they have an integer nomber for total magnetic moment (Mt = 3μ_B for Co2CrAl and Mt =2 μ_B for CoCrSb), these results obey to Slater Pauling rules[3, 4]. Co2CrAl and CoCrSb Heusler alloys features are characterized by full spin polarization at the Fermi level with 100%. From the elastic properties calculation, Co2CrAl and CoCrSb are mechanically stable All features cited above, allow the compound to be a good candidate for the spintronic applications

Structural, Mechanical, Electronic, and Magnetic Properties of Pd2TiZ (Z = Al, Ga) Full-Heusler Compounds: a DFT-Based First Principle Investigation

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Abstract: Structural, elastic, and electronic properties as well the magnetism of Pd2TiAl and Pd2TiGa ternary full-Heusler alloys have been systematically investigated using the full potential linearized augmented-plane wave (FP-LAPW) method based on the density functional theory, within the generalized gradient approximation (GGA). The obtained results for the lattice parameters, bulk moduli, elastic constants, and spin magnetic moments agree well with the available experimental and theoretical data. Furtheremore, the estimated elastic constants and their derived elastic modulus of Pd2TiAl and Pd2TiGa indicate that they are mechanically stable in an L21-type structure, ductile and anisotropic. We have also computed the Debye temperatures from the average sound velocity and the melting temperature. An analysis of the electronic properties, including the band structures and the densities of states, reveals that the herein studied compounds exhibit metallic ferromagnetic behavior. In addition, the magnetic properties indicate that the Ti atom is responsible for the large magnetic moments of the alloys under study.

Crystal structure and electronic properties of complex hydride

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Abstract: First principles calculations of the structural, the band stucture of the orthorombic complex hydride have been accomplished using the density functional theory within the local density approximation and the generalized-gradient approximation (GGA) with the Perdew–Burke–Ernzerhof (PBE) functionals. The Vanderbilt ultrasoft pseudopotential with an energy cutoff of 450eV and a 8×6×8 Monkhorst pack grid are used in the electronic Brillouin zone integration for all calculations. We have calculated the lattice constant, the band gap for . we have defined the previous valus of energy cut off and nember of k points by doing convergence test and geometry optimization Before any calculation .

Synthesis and Characterization of NiO-ZnO thin film doped with Ag for photocatalytic degradation of Methylene blue

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Abstract: Photocatalytic Ag-loaded (NiO)0.5-(ZnO)0.5 thin film was synthesized by the sol-gel dip-coating method, with the Ag content 2%. deposited on glass substrate at room temperature and then annealed at 500 °C. The structural and optical properties of the film was investigated in detail using X-ray diffraction patterns, UV–Vis spectrophotometry. XRD results reveal that the nanocomposite thin film is polycrystalline with ZnO hexagonal wurtzite and NiO cubic structures and no secondary phases were observed, we have found that the film have a grain sizes at 15–21 nm range. UV- visible transmittance spectra of the prepared film revealed good transparency in the visible region. The photocatalytic activities of the deposited Ag - NiO–ZnO thin film was evaluated by the degradation of methylene blue (MB) in an aqueous solution under UV light irradiation.

Computational calculations, molecular docking and antibacterial activity of palladium complex derived from furopyran-3,4-dione ligand

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Abstract: Metals, in particular, transition metals have a potential advantage over the most common organic-based drugs. Several works support that palladium (II) derivative complexes revealed an interesting antimicrobial activity comparing to their free respective ligands. In this case, Computational calculations were applied to define theoretical spectra, electronic proprieties and the reactivity of molecules using Density Functional Theory method. DFT results confirm the structure and geometry of compounds then predict their biological activity. Molecular Docking of the ligand and its respective palladium complex was applied in order to study their molecular interactions against S. aureus bacteria strain. Furthermore, the antibacterial activity was evaluated against Staphylococcus aureus and Escherichia coli strains using disc-diffusion method.

Numerical Study of Heat Transfer by Mixed Convection in a Cavity Filled with Nanofluid

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Abstract: In this work, a numerical study of stationary laminar mixed convection in a ventilated square cavity has been presented. The cavity is filled with different nanofluids and contains two gates (ports) to enter and exit the flow. The straight vertical wall is maintained at a warm temperature, while the other walls are considered adiabatic. The equations governing flow and heat transfer have been solved by the finite volume method using a second-order centered Upwind scheme. Numerical simulations are carried out in the case of pure water fluid, and mixtures of this basic fluid and nanoparticles (Ag and Cu), for a number of Ri varying from (0.04 to 4) and a volume fraction of the nanoparticles between (0% and 10%). The study presented in this work is devoted to a dynamic study in which the Grashof number is fixed at 104, and the Reynolds number is varied. The numerical results obtained show that the heat transfer increases with the increase in the volume fraction also that the enhancement of the product of entropy generation and heat transfer increases considerably with the increase in the Reynolds number. The most effective nanoparticles for increasing the heat exchange rate are Ag. The latter are characterized by a large local Nusselt number, that is to say a very good heat transfer compared to that of metallic Cu nanoparticles.

Biological properties study of biomaterial diopside prepares from raw materials

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Abstract: Diopside ($CaMgSi_2O_6$) ceramics have been proposed as a medical material for artificial bone and dental root, since they proved to be bioactive and biocompatible. In this study, $CaMgSi_2O_6$ powders were synthesized by mixing of starting materials (doloma and SiO_2) for 4 h, and subsequent calcination of the mixture at 700 °C for 2 h. The compacts were conventionally sintered at 1300 °C for 2 h. Moreover, the in vitro bioactivity of diopside was investigated by soaking the $CaMgSi_2O_6$ granules in simulated body fluid (SBF) for various time periods to analyze the nucleation and growth of hydroxyapatite (HA) on the surface of the powders. The chemical functionality and morphology of specimens of diopside was determined from its X-ray diffraction (XRD) spectroscopy and scanning electron microscopy (SEM). The obtained results showed that hydroxyapatite (HA) could form on the surface of $CaMgSi_2O_6$ particles soaked in SBF solution for 7 days, and this result was confirmed by the characteristic peak of HA at $2\theta = 31.68°$. In addition, SEM micrographs of diopside soaked in SBF solution for 21 days revealed a change in surface shape of the powders, and a continuous layer of dense deposits specific nano-sized crystals (in the form of rice) of HA covered the surface of $CaMgSi_2O_6$ powders after 21 days of soaking in SBF solution. Finally, the obtained results indicate that $CaMgSi_2O_6$ showed to be highly bioactive through the formation of homogeneous apatite layer

Simulation study of the electrical field's distribution effect on the self-cleaning phenomenon of superhydrophobic coating

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Abstract: The main objective of this research is to carry out a numerical study on the electro-hydrodynamic behavior of water drops, with fixed electrical conductivity, in motion along the creepage distance of a superhydrophobic coating under HVAC, this is carried out using the configuration of the field and the electric potential. Several factors are examined, such as, the presence and absence of a dielectric cover, the variation of its relative permittivity and that of the superhydrophobic layer, number of layers, volume and number of water drops. It follows from this study, a conformity between the numerical and experimental results. In addition, the presence of the cover does not have an influence on the direction of the drops' expulsion from the surface; on the other hand, it affects the evacuation order of the latter. It is to be noted that the relative permittivity of the insulating cover does not have a great effect on the ejection of the drops. Also, we noticed that the number and volume of water drops affect the distribution of electrical field. However, the number of superhydrophobic layers doesn't exercise a big difference.

Electrical behavior of zinc phosphate glass doped with Ce3+: Application of Joncher's power law

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Abstract: The impedance spectroscopy technique was used to study the electrical properties of a series of Na2-3xCexZnP2O7 phosphate glass samples (with, x = 0 and 1 mol %). The measurements were performed in the frequency range from 10-2 to 1 MHz and in a temperature range 273-473 K. The results showed that the conduction mechanism is reacted by the Jonscher law, which is ensured by thermally activated correlated barrier hopping (CBH).

Numerical study of the thermal performance of a hybrid nano-fluid in a trapezoidal channel with obstacles.

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Abstract: This study aims to simulate a two-dimensional flow pattern in the stratified convection system of a trapezoidal channel containing obstructions (porous medium) and nano-hybrid fluoride AL2O3-SiO2-H2O. For this purpose, thermal cooling was carried out by solving the equations governing 2D steady-state laminar force convection. We found that there is an effect of the obstacles on the flow rate and the temperature of the fluid inside the channel. There is also an effect on the shape of the channel and the shape of the heat exchange obstacle, and the results also showed that the increase in fracture volume leads to improved heat exchange in the convection cooling process.

Physical properties of the quaternary Heusler alloy NbVMnAl. First principle study.

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Abstract: Structural, electronic, magnetic, elastic and thermodynamics Heusler compound Quaternary properties NbVMnAl have been calculated by the method of pseudo-potential and plane waves (PP-PW) method based on the theory of the functional of the density (DFT) using the CASTEP code. We used the approximation of generalized gradient GGA for the term of the exchange and correlation potential. First, we determined the structural stability of this compound, after calculating the minimum total energy of the three proposed types. Type 1 which has a minimum total energy with a negative cohesion (-26.04 eV) and formation energy (-1.65 eV) is studied. The electronic and magnetic properties are also discussed, according to the calculation of the structure of electronic band and the density of total States polarized spin, we found that this compound has a gap for majority spin states(0.81 eV). NbVMnAl compound exhibit a half mettalicity and has an integer nomber for magnetic moment (2.0$\boldsymbol{\mu B}$,), that it obei to Slater Pauling rules. Half NbVMnAl Heusler alloy feature is characterized by full spin polarization at the Fermi level with 100%. From the elastic properties calculation, NbVMnAl is mechanically stable All features cited above, allow the compound to be a good candidate for the spintronic applications

Phase stability and optoelectronic properties of Cd-doped of Cu2ZnSnS4 compound for the solar cell systems

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Abstract: The purpose of this work is to present a study of phase stability and optoelectronic properties of cd-doped of cu2znsns4 compound. All properties are studied using the first-principles calculations in the framework of the dft. The exchange-correlation functional described by perdew–burke–ernzerhof of the gga was utilized to investigate the phase stability and elastic properties. Besides, for the optoelectronic analysis the tran-blaha modified becke-johnson approach combined with pbe-gga+u was used to give a better description of the electronic structure and optical spectra. The calculated lattice parameters are in concordance with the available results. The electronic structures revealed that all studied compounds are direct semiconductors at central symmetry and their energy band-gap values change linearly from 1.457 to 1.353ev, when cd-doping concentration varies.

An efficient analytical approach to investigate thermal behavior of a wetted longitudinal porous fin of different profiles: Optimal Homotopy Asymptotic Method

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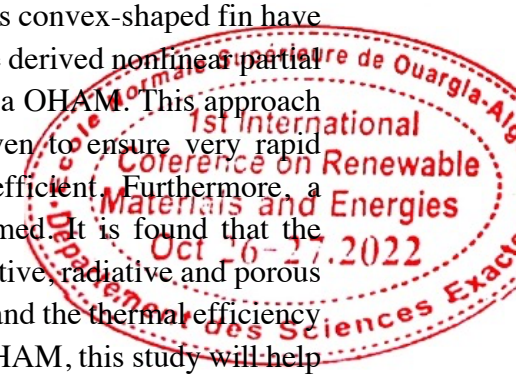
Abstract: Optimal homotopy asymptotic method (OHAM) is applied to investigate thermal behavior of a porous longitudinal fin in a fully wet circumstance in the existence of convection as well as radiation effect. The thickness of the fin is assumed to vary with the length of the fin. Therefore, two different profiles of the fin such as rectangular as well as convex-shaped fin have been considered. Darcy's model is imposed to study porous nature. The derived nonlinear partial differential equation is non-dimensionalized and solved analytically via OHAM. This approach is used for the first time to solve this problem as it has been proven to ensure very rapid convergence of the solution only after one iteration and highly efficient. Furthermore, a comparative analysis of three different shaped fins has been performed. It is found that the adimensional fin temperature decreases with the increase of the convective, radiative and porous parameters which leads to increase in heat transfer rate through the fin and the thermal efficiency of the porous fin. In addition to the mathematical aspect of applying OHAM, this study will help in proper thermal analysis of fins and in the design of passive heat enhancement devices used for thermal and electronic systems.



Free vibration of the fundamental frequencies of isotropic square/rectangular plates using the p-version of the finite element method

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Abstract: The primary objective of this work is to develop the p-version of the finite element method (FEM) based on a first ordre sheare deformation theory to analysis of of isotropic square/rectangular plates. The fundamental frequencies of the square and rectangular plate considering FSDT models for various plate thicknesses has been plotted to analyze the numerical result. the contribution of this work is investigated by a comparison of free vibrations of isotropic square/rectangular plates using p-version of the FEM and to present new results and discussion that can be used as a reference in other work, found an excellent agreement.

First principles Study of Some Fundamental Physical Properties of the half Heusler alloy LiGaSi

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Abstract: In this study, structural and electronic properties of cubic half-Heusler compound LiGaSi have been reported using density-functional theory (DFT) as implemented in the ABINIT code package for the exchange correlation potential we have used the generalized gradient approximation GGA-PBE developed by Perdew-Burke-Ernzerhof. Electron ion interactions are evaluated using nonlocal norm conserving pseudopotentials generated using the Hartwigsen Goedecker-Hutter scheme. The elastic constants ( ) are calculated by using the density functional perturbation theory (DFPT) from second derivatives of total energy with respect to the strain perturbation as implemented in the ABINIT code. The last part of our study deals with the investigation of the thermodynamic properties of the LiGaSi alloys. In this context, we used the quasi-harmonic Debye model implemented in the Gibbs2 program. Our results for the structural and elastic properties such as the lattice constant, the bulk modulus and Cij, were found to agree well with the previous theoretical works, the electronic (Band structure) and thermodynamic properties, including the variation of the volume, bulk modulus, thermal expansion coefficient, heat capacity at constant volume CV, heat capacity at constant pressure CP and entropy were predicted and discussed

Optical Properties Of Fe2O3 ,Dope Cobalt Thin Films deposited by spry pyrolysis

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Abstract: Transparent thin films of □-Fe2O3 have been deposited on glass substrates and Cobalt doped by chemical spray pyrolysis (CSP) technique using solution of aqueous iron chloride (FeCl3) at 350 C°. optical, properties were investigated post-deposition annealing. The optical data revealed that the optical indirect band gap energies of films were 1.9 eV

First-principles study of electronic structure and magnetic properties of diluted magnetic Semiconductor Be1-xFexS.

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Abstract: We have employed the full-potential linearized augmented plane wave (FP-LAPW) method based on spin-polarized density functional theory (DFT) to investigate for the first time the structural, and magneto-electronic properties of the ordered dilute ferromagnetic semiconductor Be1-xFexS (x = 0.25). For the exchange-correlation functional, the generalized gradient approximation GGA-PBEsol has been used. The electronic band structures and density of states of this diluted magnetic semiconductor (DMS) have shown that the minority spin channel exhibit a metallic nature, while the majority spin channel has a semiconductor character. The total magnetic moment of Be1-xFexS alloys is mainly due to the Fe site with very small contribution of Be and S atoms. According to the magneto-electronic findings, this new diluted magnetic material show a great potential for spintronic devices.

Physico-chemical proprieties of aluminium coatings

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Abstract: Protection of steel parts from corrosion is of ground importance for the industry as mechanical resistance is to be maintained. Corrosion protection by metal coatings using wet processes is still widely applied. However, such processes are not environmentally friendly because of the required disposal of heavy metal containing effluents. This is particularly true for hard chromium plating. Protection of steel from corrosion can be ensured through sacrificial aluminium coatings. For that purpose, base aluminium coatings were deposited by d.c magnetron sputtering and investigate in order to answer the mechanical and physico-chemical requirements with a good mechanical resistance.

The effect of nano silica filler on the mechanical and thermal characteristics of rubber blend

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Abstract: In recent years Polymer blending has proven to be economical and simple optional approach to develop and invent new polymeric materials A wide variety of methodologies is available to improve the properties of the existing polymers such as the modification of their technical features by adding fillers. Several fillers are commonly used in the rubber industry to modify and improve the physical and thermal properties of elastomeric material. The physical and thermal performance of the elastomeric are strongly influenced by several parameters Nano composite has exceptional mechanical properties compared to conventional micro and macrocomposites, even with very low nano filler conten.

The mixture of the natural rubber, which has high tensile strength, excellent fatigue wear resistance, high compressive strength and low resistance to heat, ozone, atmospheric agents, petrol, animal and vegetable oils with a synthetic rubber Acrylonitrile butadiene rubber which provides good resistance to fuel, vegetable and animal oils, water, alcohols and other substances, seems to generate remarkable characteristics . NBR has also a low gas permeability explaining its usage in areas such as pipes, seals, belts, health products, gloves, etc..

The main objective of our work is to study the influence of variable proportions of natural rubber and acrylonitrile-butadiene rubber reinforced with nano-silica and carbon black on the mechanical and thermal characteristics of the rubber. Thus, in this study, 20% of carbon black and/or 3% of nano silica are added to different blends of NR and NBR with different ratios.

Solar towers are a promising future for renewable energies and an important source of electrical energy production

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Abstract: Electrical energy is one of the most important necessities on which man relies in his various daily needs, especially economic, but the growing demand for it in the regions of the world imposes on researchers and experts in the matter the improvement of the modes of production electric energy by the means of renewable energies of various types. As researchers, we attach the highest importance to the solar towers which are considered as one of the most important sources of production of energy and an important model in renewable energies and a new mechanism that can be developed in energy production, especially in areas with good Direct radiation (DNI). Solar towers are experiencing rapid development and improvements in solar panels (heliostats), receiver power, tower height, energy storage thermal (TES). The problem posed is where research and various technological studies on solar towers have reached recently

Appropriateness of the finite element method at the atomic level and studying the elastic properties of the carbon nanostructures

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Abstract: The development of the nanotechnology field revealed exceptional nanostructures like the carbon nanotubes (CNTs). The exceptional mechanical properties of these structures, have attracted the scientists to develop several experimental and numerical techniques to study CNTs. Among the famous numerical methods, we reformulate the finite element method (FEM) based on the molecular mechanics approach (MM), in order to investigate the Young's modulus and Poisson ratio under different CNT geometry and chirality. This study demonstrates the effectiveness and the accuracy of the present FEM to investigate the mechanical properties of the materials at the atomic level in standard time.

Capacitance performance of FTO/MnO2 thin films synthesized by direct and pulse potentiostatic methods

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Abstract: Transition metal oxides have applications in energy storage devices such as electrochemical supercapacitors. The work consists in the electrodeposition of manganese dioxide (MnO2) thin films under direct and pulse potentiometer onto FTO substrate. The effects of the pulse electrodeposition conditions are systematically investigated. The results show that the pulse time influences clearly the morphology of thin films deposited.

The characterization of the Thin films was performed by electrochemical methods (cyclic Voltammetry, electrochemical impedance spectroscopy (EIS), galvanostatic charge-discharge). Moreover, nanostructured FTO/MnO2 films prepared with pulse electrodeposition method demonstrate high power performance, excellent rate as well as long-term cycling stability, which make them promising electrode materials for supercapacitor applications

Application of photovoltaic system at wastewater station in ouargla city

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Abstract: Solar energy is expected to play a very important role in meeting energy demands in the near future. Since it is a clean type of energy with a diversity of applications, decentralized nature and availability, solar energy will represent a suitable solution for energy requirements especially in rural areas. It is important to state that the use of solar energy in rural regions will protect these areas from pollution, since the use of solar home systems avoids large amounts of CO2 emissions

In this work, we consider the design of a photovoltaic system and its application to a wastewater treatment plant as a rural area.

We carry out the optimization of the PV-STEP system consisting of photovoltaic panels and a purification plant.

The results obtained show the influence of some parameters such as: the solar collection system, the site and the type of PV cell.

First-principles calculation of Structural, Electronic, and Thermoelectric properties of Mn2PtCo Heusler alloys

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Abstract: A theoretical study of the structural, electronic, and thermoelectric properties of full-Heusler Mn2PtCo compound with Hg2CuTi and Cu2MnAl-type by using the first principles density functional theory (DFT) calculations performed in the full potential linear augmented plane wave (FP-LAPW) method as implemented in the WIEN2k code , The exchange and correlation potential is treated approximations:GGA-PBE The total energy calculations show that the investigated compound is energetically more stable in Cu2MnAl-type structure in the Non magnetic (NM) phase than Hg2CuTi-type structure With regard to the Heusler Mn2PtCo compound the results show, according to the electronic properties of these alloys, that they have a semiconductor moreover these compounds are characterized by a very important value of the factor of merit (ZT) and the Seebeck coefficient (S), which make these compounds promising candidates for thermoelectric applications.

Study of structural and electronic properties of ternary alloys GaxTl1-xP (x = 0.25, 0.5 or 0.75)

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Abstract: In this work, we have studied the structural and electronic properties of ternary alloys GaxTl1-xP using a Full-Potential Linear Muffin-Tin Orbital (FP-LMTO) method based on The Density Functional Theory (DFT). For the exchange and correlation potential term, we have studied the effects by using Local Density Approximation (LDA).

The obtained values of the structural and electronic properties are in good agreement with certain theoretical results and close to the experimental ones.

First-principles study of the global stability of LaBa for Hydrogen storage.

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Abstract: Currently, the solid state storage option of hydrogen has become a future energy carrier for electricity generation and storage. In this work, we study the structural properties of the binary intermetallic compound LaBa in different structures, in order to obtain the lattice optimization parameters and formation energy. We also investigate the thermodynamic and mechanical stability of the above compound. The first-principals calculations are carried out using the full-potential linearized augmented plane-wave (FP-LAPW) method as implemented in the code WIEN2K.

Effect of concentration and salinity on the rheological behavior of a drilling polymer

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Abstract: Oil drilling is part of the set of operations necessary to locate and extract from the reservoir rock the hydrocarbons present in the subsoil. The success of a drilling operation is ensured by several factors, including the choice of drilling fluids. The knowledge and control of the rheological properties of these drilling fluids have a major impact on the success of the drilling operation. The behavior of the drilling mud is directly related to the polymers used as suspending agents or filtra reducers.The objective of this work is to study the rheological behavior of a polymer (a polysaccharide, namely xanthan gum) used as drilling fluid. The study of the effect of the concentration of xanthan gum (0.4%, 0.6% and 0.8%) on the rheological behavior of water-polymer systems was studied as well as the effect of temperature and salinity (addition of kcl and nacl).The herschel-bulkley model is the most adequate to describe the rheofluidic behavior of this type of polysaccharide. For the water-based drilling mud,the results show that the addition of xanthan gum and salt (nacl) increase the viscosity. At 04% xanthan we note an apparent viscosity of 5.05 pa.s, while the apparent viscosity increases to 44.35 pa.s for the drilling mud formulation based on xanthan and nacl.

Indentation hardness evaluation of ZrN coatings deposited with HIPIMS technique

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Abstract: Nanocrystalline ZrN films were successfully deposited on AISI 316 stainless steel substrates using high power impulse magnetron sputtering (HIPIMS) technique. The effect of nitrogen flow rate (ranging from 2.8 to 6.8 sccm) was investigated on the structure, and mechanical properties of the ZrN films. The results showed that the variation of nitrogen flow rate significantly affect the film rugosity, preferred orientation and hardness.

It can be seen that the preferred orientation according to the plan (111) were observed for the ZrN films deposited with a nitrogen flow rate of 5.3 Sccm. whereas for a nitrogen flow rate of 6.8, the preferred orientation has been changed in favor of the plan (200).

The ZrN films were very smooth with a roughness number ranging from 2.58 to 0.54 nm, generally decreased with increasing nitrogen flow rate. It was found that the hardness of the nanocrystalline ZrN films, ranging from 34.06 to 73.6 GPa, decreased by increasing the nitrogen flow rate.

Study of Si:C ratio of the electrochemical properties of silicon/carbon based paste anode for Li ion batteries.

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Abstract: The aim of this work is to study the influence of the percentages of the components of the conductive paste which constitutes the anode based on Silicon on the electrochemical behavior of Li-ion batteries. The conductive pastes are composed of silicon as active material, carbon as conductive agent and PVDF as binder. To realize our study, we elaborated two pastes, one with a percentage of 65% of Si that we called PSi1 and the other with a percentage of 70% called PSi2. The silicon powder as well as the carbon powder used were crushed in a ball mill in order to obtain a micrometric size of the grains. Concerning the preparation of the pastes, we mixed the constituents in a mortar in order to ensure their homogenization. The elaborated pastes were deposited by the doctor blade technique on copper support. The characterization techniques used in this study are: scanning electron microscopy (SEM), laser granulometry. The electrochemical performances of the anodes were studied by cyclic voltammetry, galvanostatic charge discharge and impedance spectroscopy. The observed SEM pictures confirm the obtaining of powders with micrometric sizes ranging from a few hundred nanometers to a few microns. The electrochemical galvanostatic measurements indicated that the electrode presents good electrochemical performances in the voltage range of 0.1 to 2V, namely an initial discharge capacity of about 2900 mA.h. g-1 for the PSi1 paste deposit and about 3300 mA. h. g-1 for PSi2. So we can say that the anode realized with the higher percentage of Si gives better electrical performances compared to the other one.

Structural properties of superconducting ceramics Bi2Sr2CaCu2O8+d

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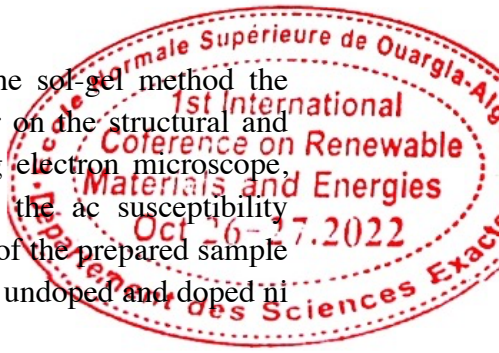
Abstract: the superconductors bi 2212 doped ni were prepared by the sol-gel method the influence of the conditions of preparation of nitrate compound powder on the structural and superconducting properties were studied by x-ray diffraction, scanning electron microscope, raman spectroscopy and transition temperatures were determined by the ac susceptibility measurement. The drx structural analysis shows the crystalline structure of the prepared sample lattice as part of the orthorhombic system, sem micrographs show that in undoped and doped ni samples the grains are very danceable and they have poor connectivity.



Theoretical investigation of rock-salt and zinc blende structures of scandium carbide and yttrium carbide

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Abstract: Transition metal carbides are metallic compounds with exceptional and many unique physical properties, for instance, high hardness, high melting point, good thermal and electrical conductivities, perfect corrosion resistance and outstanding thermal stability. Futhermore, they also have attractive electronic, optical properties and are known as hard refractory materials. Owing to these motivating properties, they are implicated in extensive technological applications such machine buildings industry, nuclear and chemical manufacturing, which make them field of both fundamental and experimental investigations. The primary purpose of this work is to provide some additional information to the existing data on the physical properties of scc and yc by using ab initio total energy calculations in the rocksalt and zinc blende structures. We try to focus on the structural and electronic structure, elastic and thermodynamic properties. The phonon dispersion curves and corresponding phonon density of states for the scc and yc are also presented and discussed in detail. The phonon calculations have been used to determine the dynamical stability of the studied compounds. We found that the fundamental ground state is the nacl-like phase for scc and yc and the two compounds change from the nacl to the zb structure at pressures of 24.67 gpa and 18.82 gpa respectively. The band structure, and density of states (dos) shows that both materials exhibit metallic behaviour even in the b1 or in the b3 phases. The band gap calculation shows also that yc is relatively more ionic than scc. The mechanical properties, incuding the elastic parameters, shear modulus, yong's modulus, and poisson's ratio were calculated. The calculated debye temperatures of scc and yc in nacl phase were found to be 594.30 k and 446k respectively. Abinitio linear-response calculations are reported of the phonon spectra and for both compounds in a rs at the normal-pressure and in a zinc-blende-type at transition pressures (pt). Ideal stoichiometric b1 crystals of scc and yc are predicted to be dynamically stable.

Structural, mechanical, electronic, and magnetic properties of Pd2TiZ (Z = Al, Ga) full-Heusler compounds: a DFT-based first principle investigation

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Abstract: Structural, elastic, and electronic properties as well the magnetism of Pd2TiAl and Pd2TiGa ternary full-Heusler alloys have been systematically investigated using the full potential linearized augmented-plane wave (FP-LAPW) method based on the density functional theory, within the generalized gradient approximation (GGA). The obtained results for the lattice parameters, bulk moduli, elastic constants, and spin magnetic moments agree well with the available experimental and theoretical data. Furtheremore, the estimated elastic constants and their derived elastic modulus of Pd2TiAl and Pd2TiGa indicate that they are mechanically stable in an L21-type structure, ductile and anisotropic. We have also computed the Debye temperatures from the average sound velocity and the melting temperature. An analysis of the electronic properties, including the band structures and the densities of states, reveals that the herein studied compounds exhibit metallic ferromagnetic behavior. In addition, the magnetic properties indicate that the Ti atom is responsible for the large magnetic moments of the alloys under study.

Temperature dependence on optical characteristics of $In_{0.4}Ga_{0.6}N/Al_{0.2}Ga_{0.8}N$ quantum well diode lasers

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Abstract: In this work, we calculate optical gain for $In_xGa_{1-x}N/Al_{0.2}Ga_{0.8}N$ quantum well diode lasers. Effects of temperature and carrier density are studied through the calculation of optical gain and transparency carrier density. The variation of peak gain on carrier density is also presented. Results show that the optical gain offers a better value in low temperature than higher temperature.

Structural, electronic and optical properties of the spinel oxide SiZn2O4

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Abstract: Density functional FP-LAPW method calculations were performed to explore the structural, electronic, optical properties of newly synthesized compound Tl2CdGeSe4. The calculations were performed relativistically, including the spin-orbit coupling (SOC).The computed equilibrium structural parameters are in excellent agreement with available measurements. Our calculations using the Tran-Blaha modified Becke-Johnson and GGA-PBEsol potential with the inclusion of SOC show that Tl2CdGeSe4 are direct bandgap semiconductors. The inclusion of SOC is found to reduce the fundamental bandgap with TB-mBJ from 1.123 to 0.981 eV and that with GGA-08 from 0.431 to 0.305 eV. The l-decomposed atom-projected densities of states were calculated to identify the contribution of each constituent atom to the electronic states in the energy bands. The upper valence subband predominantly comes from the Se-4p states, while the bottom of the conduction band mainly originates from the Se-4p and Ge-4p states. The frequency-dependent linear optical parameters, viz., the complex dielectric function, absorption coefficient, refractive index, reflectivity and energy-loss function, were calculated for electromagnetic waves polarized parallel and perpendicular to the c-axis in a wide energy window. An attempt was made to identify the microscopic origin of the peaks and structures observed in the calculated optical spectra.

Physical and Optical Properties Studies of Perovskite (CH3NH3PbBr3) based PeLEDs

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Abstract: The past few years have witnessed tremendous developments in LED lights. Organometal halide perovskites have been regarded as promising materials for optoelectronic applications with high efficiency such as solar cells, photodetectors, optical amplifiers, light emitting diodes (LEDs), and laser diodes. In 2014, the first high brightness infrared and visible electroluminescence (EL) from solution processed perovskites materials was demonstrated at room temperature .This extraordinary feature, along with other unique electrical and optical properties represent perovskite materials as appropriate candidates for high-performance, large area and low cost LEDs. In this work, a perovskite light-emitting diode (PeLED) was analysed using Silvaco Tcad.The simulation and their visual outputs have been improved. The performance of the device is checked as a function of perovskite, as the active layer. The result shows that the highest gloss can be achieved by a perovskite layer with a thickness in the range of 5-20 nm. Moreover, the density of trap cases which indicates the quality of the active layer, is considered one of the most important parameters of improving the efficiency of PeLEDs.

Study of the effect of copper residues on the productivity of simple solar distillation in southeastern Algeria.

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Abstract: A survey was conducted to find out how to improve the productivity of copper filings reinforced solar stills. For this purpose, two fixed solar panels with the same tilt angle were used and installed side by side in the same weather conditions in southeastern Algeria. The amount of copper filings added was 50 g. The improvement in solar energy performance is still 29%.

Structural, Elastic, Electronics, and Magnetic Properties for Quaternary Heusler CoFeTiSi Compound

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Abstract: The Heusler compound Quaternary CoFeTiSi is studied in this paper to present a theoretical investigation into its structural, electronic, elastic, and magnetic properties. In the WIEN2k code, which is based on the density functional theory (DFT), the augmented plane wave method (FP-LAPW), which uses the generalized gradient (GGA) approximation, was used to do the calculations. The results are consistent with important theoretical computations. Our findings indicate that this compound adheres to the (Slater-Pauling) Mtot = (ZT-24) μB rule and is a half-metallic compound.

Influence of Single-Phase PV Control On Three-Phase LV Network

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Abstract: In order to meet the growing demand for electricity and improve the quality of service and reduce pollution, the existing grid infrastructure must be developed in Smart Grid (SG), flexible for interconnection with decentralized production. However, the integration of decentralized generation into the electricity grid, especially the distribution network, poses several technical problems This paper discusses the influence of adjusting the voltage of integrated single-phase PV on the quality of the voltage of the three-phase network, in particular the Line Voltage Unbalance Factor (LVUF). The degradation of the LVUF, is one of the problems to be avoided in three phase electrical networks. A simulation study is carried out on a three-phase LV network when single-phase domestic photovoltaic systems equipped with a voltage controller are connected to the LV network. The results of simulations showing that there is a deterioration of the LVUF caused by the significant difference between the RMS values of the voltages of the three phases.

Study of the effect of copper residues on the productivity of simple solar distillation in southeastern Algeria

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Abstract: A survey was conducted to find out how to improve the productivity of solar stills reinforced with iron filings. For this purpose, Two solar fixed solar stills with the same angle of inclination and mounted side by side in the same weather conditions were used in southeast Algeria (El Oued City). The amount of iron filings added was 100 g. The improvement in the performance of the solar still was 21.95%.

Effect of thermal heating rate on the crystallization kinetics parameters of Zinc Sodium Phosphate glass.

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Abstract: The diversity of use of phosphate glass as suitable material for solid laser, applications biomaterials, battery materials, conductor ionic led to the intensity of its study. The aim of the present work is to investigate the crystallization kinetics in sodium zinc phosphate Na2ZnP2O7 (NZPO) glass which was synthesized by melt quenching method, using differential thermal analysis (DTA). The DTA results showed that the peak of crystallization process was in the range of 692–731K. In order to compare the activation energy values of phosphate glass with other glasses, the activation energy has been calculated through the non-isothermal method and the obtained value was 77,63 KJ.mol-1. The growth morphology parameter m is close to 3. The calculated local Avrami exponent increases with increasing of crystallization fraction for all heating rates. In the area of $0.1 < X < 0,4$; the value of n(X) is close to 3, which means that a three-dimensional growth of crystals with bulk nucleation and interface reaction from a constant number of nuclei. Bulk nucleation and interface reaction with varying number of nuclei when $X > 0,6$.

Ca1-xLaxFeO3 (0.3≤x≤0.6), a potential material for cathode applications in SOFC.

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Abstract: Meeting global energy needs in a sustainable way is one of the biggest challenges facing humanity in the 21st century. The difficulty of this method is to face the actual poverty respecting the capacity of the future generations to face their lack. Therefore, our focus in this work will be on the Solid Oxide Fuel Cell (SOFC) because of its high efficiency, long-term stability, fuel stability, low emissions, and low cost. We have investigated the crystal structure of perovskite 〖Ca〗_(1-x) 〖La〗_x FeO_3 (0.3≤x≤0.6) compounds. Multiferroic nanopowder was synthesized via Sol-gel method with nitrates technique. The structure was confirmed by X-ray powder diffraction (XRPD) and determined using Rietveld refinement indicated that the samples were single phase and crystallized in an orthorhombic system (space group, Pbnm no.62). The effect of introducing Ca into the orthorhombic lattice resulting in a very slight increase in the lattice parameters. Both cell volume and grain size as estimated from X-ray diffraction increase from 233.17 to 241.34 Å3 respectively as the La continent increased from 30% to 60%. The slight increase in cell volume can be correlated with two phenomena, the first one is the increase in Fe4+ continent as the size of Fe4+ ion is smaller than the Fe3+ ion (0.585 vs. 0.645 Å). The second one is attributed to the size mismatch between Ca2+ (R_(〖Ca〗^(2+))= 1.14 Å) and La3+ (R_(〖La〗^(3+))=1.36 Å) ions in these compounds.

An application MATLAB for Standard and modified Judd-Ofelt theories analysis from Pr3+ absorption and emission spectra

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Abstract: In this report, we will suggest both the standard and modified Judd-Ofelt scientific theories. These theories will be applied using MATLAB to calculate the Judd-Ofelt intensity of various parameters as well as derived values from absorption and emission spectra of Pr3+-doped for better quantum efficiency. The program is easy to use and doesn't require any prior last knowledge in the domain of study. The program was tested on luminescent praseodymium doped glass: 69.75Sb2O3-20WO3-10NaO2:0.25Pr3+ in order to identify their role in the development of optoelectronic devices. We want to provide academic researchers with this theoretical tool so they can perform calculations more quickly, easily, and accurately.

Optical and electrical conductivity of Li:NiO films deposited by spray pyrolysis.

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Abstract: Nickel oxide is an excellent competitor in many modern technological applications such as smart windows and solar cells. Hence, NiO thin films with different concentrations of Li doping were made by an easy and low-cost technique called chemical spray pyrolysis. This research included some physical investigations of pure and Li-doped NiO thin films. In this study, we will be interested in determining the optical and electrical conductivity using UV spectroscopy technique in each sample because these parameters have a major role in increasing the efficiency in technological uses such as solar cells. The results showed that there is an effect of lithium doping, through the change of conductivity values when the doping increases.

Dimensioning and realization of an LTCC multilayer capacitor for energy conversion

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Abstract: In this presentation, we present the sizing as well as the thermal and electrostatic modeling of a low temperature cofired ceramic multilayer capacitor (LTCC) to insert it in a Buck converter. We also present the different stages of the realization of the LTCC capacitor, such as the pre-cutting of dielectric material that we will use by the laser machine of small squares of 1.5 cm2, in the second stage we put the conductive tab (Silver Ink - ESL 9916) on both sides of dielectric (LTCC-ESL41020). The next step is the assembly of the layers into a single component which will go through thermo-compression following a well-defined thermal cycle. The final step is the characterization of this capacitor by an impedance analyzer type HP4191A. The results obtained show that the behavior of this component is capacitor, whose resonance frequency is 26.2Mhz and an equivalent resistance ESR =9.2Ω, and an equivalent inductance ESL =0.66nH. In this realization, the objectives aimed are the reduction of the volume and the weight of this component, a good behavior in frequency, low values of the series inductance and series resistance, and small ripples of the output voltage. The results obtained after completions are satisfactory and encouraging, with a 92% reduction in volume. To validate the correct operation of this capacitor, we used the PSIM simulation software to compare the different voltage and current waveforms of the outputs of the Buck converter with a perfect capacitor and others with an LTCC capacitor. COMSOL simulation software allowed us to determine the operating temperature of the LTCC capacitor and to validate its electrostatic behavior (distribution of electric potential, electric field and electric current density.

Ab-initio study for the elastic stability, structural and electronic properties of Rh2CuGe full Heusler alloy.

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Abstract: First-principles calculations based on density functional theory (DFT) using the Wien2k code code with the self-consistent full potential linearized augmented plane wave (FP-LAPW) method are used to calculate the structural, electronic and elastic properties of the Rh2CuGe full Heusler alloy . In this work, for the exchange-correlation energy, the generalized gradient approximation (GGA) functional is used. Calculation of structural properties of Rh2CuGe full-Heusler alloy shows that the L21 phase makes the ground state, this alloy was found to be more stable in the non-magnetic phase in this structure at equilibrium lattice constant a= 6.000 Å. The band structures and the density of states curves are presented for the alloy intended to interpret the electronic stabilities of Rh2CuGe Heusler compounds in the L21 phase, which revealed the metallic character of this alloy. The mechanical stabilities of the Rh2CuGe compound have been analyzed according to the elastic constants; it is obvious that, from our values taken from the Mehl model satisfy the stability criteria of a cubic material, indicating that the Rh2CuGe alloy is mechanically stable.

Ab-initio study of Skutterudite compounds, for thermoelectric application

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Abstract: Thermoelectricity is currently experiencing a strong resurgence of interest as a possible source of clean energy, as waste heat sources are abundant; but large-scale applications will only be feasible through optimization of materials and modules. This search for new materials must reconcile two thermoelectric effects independently, electrical and thermal effects (good electrical conductivity and low thermal conductivity).

One of the most famous “cage compound” structures is that of skutterudites, materials with the generic formula MX3 (with M a transition metal and X a pnictogen), in which a heavy atom A is introduced to form a ternary skutterudite RM4X12 (with R is a rare earth). This filling promotes the modification of electrical conductivity and thermal conductivity allowing an increase in the power factor ZT.

The skutterudites materials for thermoelectric applications and the study of their physical properties, using a first principle ab-initio method based on density functional theory (DFT).

One-step Electrosynthesis of Cuprous Oxide-Sodium Dodecyl Sulfate Cu2O-SDS as Electrode Materials for Super- Capacitors application

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Abstract: In the present work, cuprous oxide-sodium dodecyl sulfate (Cu2O-SDS) films were in situ elaborated on an indium-doped tin oxide (ITO) glass substrate, using the potentiostatic electrodeposition method. The electrolytic solution consisted of an aqueous solution of CuSO4 (0.05 M) containing a small amount of sodium dodecyl sulphate surfactant (few mM of SDS). The deposition potential was fixed at -0.6 V vs. SCE. . In addition to the in situ electrochemical characterization, by using cyclic voltammetry carried out in an adequate potential window, in the aqueous electrolyte of KOH at different scanning rates, and by chronoamperometry under an appropriate potential, which allowed us to verify the existence of the deposit at the surface of the substrate, these deposits were also studied by the use of UV-Vis spectrophotometry, and Fourier Transform Infrared (FTIR) spectroscopy. FTIR spectra of Cu2O show a characteristic band at 631 cm-1 , which belongs to the vibrational mode of Cu–O in the Cu2O phase at –0.6 V vs. SCE [1]. The optical properties of Cu2O films reveal high optical transmission (>80%) in the visible light region. The optical energy bandgap was found to be 2.1 eV, which is in good agreement with values reported for Cu2O films by other authors [2,3], this value decreases to 1.7 eV when adding few mMs of SDS to the electrolyte. The work carried out is clearly justified by the fact that the binary composites possess better electrochemical capacities compared to the individual components when they are used in energy storage devices. The specific capacitance calculated by cyclic voltammetry (CV) under 100 mv.s-1 scan rate gives 1.8 mF/cm2 for ITO/Cu2O, which rises to 2.6 mF/cm2 for the ITO/Cu2O –SDS binary composite film.

Study of the electronic, mechanical stability of compounds based on alkali and alkaline-earth metals

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Abstract: The objective of this work is to study the electronic, mechanical properties of RbC and SrC compounds. First-principles calculations have been performed using the plane-wave pseudo potential approach within the density functional theory (DFT) implemented in the Quantum- ESPRESSO package. The exchange correlation term was treated using the generalized gradient approximation of Perdew, Burke and Ernzerhof (PBE-GGA). The results show that the SrC is a half-metallic ferromagnetic in this B1 phase, whereas RbC is a semiconductor and takes the anti-ferromagnetic state. The calculated elastic constants satisfy the mechanical stability conditions.

Production of carbon nanofiber on supported metal catalysts

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Abstract: The catalytic decomposition of methane (CDM) is a simple reaction that simultaneously produces pure hydrogen (H2) and full or empty carbon nanofibers (CNFs) with near-zero Cox (x=1,2) emissions. Ni/Z and Ni/M materials (Z=H-ZSM-5, M=MCM-41) are effective catalysts for this reaction.

In this work, we prepared mixed supports by mixing the two structures Z and M at different mass proportions (xZyM, x = % by weight of Z, y = % by weight of M = 100-x) and showed that these mixed carriers are better Ni carriers (Ni: 50 wt%) than separate Z and M for methane cracking reaction at 620°C. An optimization is observed for the 50% Z and 50% M mixture. It emerges from the XRD spectra of the fresh reduced catalysts that the average size of the nickel particles of the Ni/50Z50M catalyst promotes the cracking of methane.

Powder X-ray diffraction analysis of the 50% Ni/50Z50M sample coked for 4 h of reaction shows the characteristic line of graphite carbon. The carbon nanofilaments quality obtained in CDM tests was determined using structural (XRD), Morphological appearance was performed by transmission electron microscopy (TEM)

A theoretical study to feed the requirements of a farm and a house in an isolated area by PV solar panels in the region of Ouargla

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Abstract: Due to the location of most of the farms in remote areas that do not have an electric power grid, which creates a problem for farmers, and given the high cost of fossil fuels and traditional energy is increasing dramatically, the world aspires to rely entirely on solar energy as a safe alternative in such areas as it is clean, renewable and decentralized , and can be attached to isolated areas easily. In this work, we conducted a theoretical study to feed the requirements of a farm and a house in an isolated area by PV solar panels in the region of Ouargla , where the region of Ouargla is located within the solar belle, the intensity of solar radiation is 2650 kwh/an/m2 and the duration of insolation is 3500 hours per year, by calculating the total capacity of the farm and house requirements And then determine the number of cells and how to connect them and the number of batteries needed. Where it was found that the appropriate system voltage for this project is the 48 V system, the number of solar panels 20, and the number of batteries 20, where the efficiency of the solar panels reached 19.5% on July 20.

Numerical study of heat transfer by mixed convection in a ventilatedcavity filled with hybrid nano-fluid

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Abstract: In this work, we carried out a numerical study of the stationary laminar flow by mixed convection in a ventilated two-dimensional cavity containing a cold cylinder in the center of the latter. The cavity is filled with different hybrid nano-fluids, (Water/Ag-TiO2) and (Water/Al2O3-TiO2)). The cavity containing two gates (Orifices) of entry and exit of the flow, for a Reynolds number (Re) fixed so that the Richardson number takes the values: Ri = 0.1, 1, 10 and 100, and a volume fraction of the nanoparticles comprised between (0% and 8%). The square cavity is heated isothermally by the surface of the lower wall by a heat source (The source is to maintain the lower wall at constant temperature), the other walls are maintained adiabatic. The equations, which govern the flow, have been solved numerically using the finite volume method. The results obtained show that the heat transfer increases with the increase in the volume fraction and the Richardson number. Thus the heat transfer rate (Nu) increases with the increase in Ri.

Computational Materials Science In Catalysts And Applications

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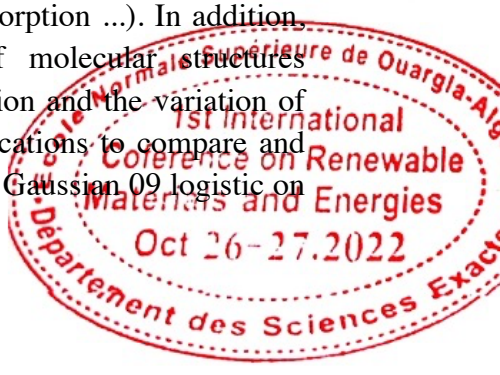
Abstract: This work focuses on a computational study on the mechanisms of oxidation of alcohols by hydrogen peroxide with the use of Fe-ZSM-5 as a catalyst. These molecular modeling methods allow us to visualize physics at work. The phenomenon of oxidation of the substrate by the MFI type zeolites (M-ZSM-5) takes place at the nanoscale, it is impossible for the chemists to observe the steps of the phenomenon. Numerical Simulations thus offers a better understanding of the catalytic phenomenon (adsorption, oxidation, desorption ...). In addition, DFT methods prove their effectiveness in the determination of molecular structures (intermediates and transitions), the frequencies of the modes of vibration and the variation of energy. They offer a very effective theoretical tool for practical applications to compare and supplement experimental studies. The studies that we conducted by the Gaussian 09 logistic on clusters of Fe-ZSM-5-substrates showed this well.



Morphology, spectroscopy and photoluminrscence properties of neodymium-coated silicon nanostructures

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Abstract: We report the morphology, spectroscopic and photoluminescence properties of thermally evaporated rare earth neodymium oxide (Nd2O3) thin films on silicon nanostructures (Si-ns) for photovoltaic applications. The aim of adding an upconversion Nd2O3 layer is to improve the efficiency of the devices by collecting the extra photons lost when using only silicon. Si-ns were prepared by the growth of silicon nitride (SiN) thin films on a silicon wafer using plasma enhanced chemical vapour deposition (PECVD) technique. The precursors inside PECVD chambre are ammonia (NH3) and silane (SiH4). Gas ratio R=NH3/SiH4 was varied between 2 and 5 to obtain different stoichiometries and Si amounts in the SiN layers. Two sets of samples were analysed. The first set comprised samples prepared with gas ratios R=2.5, 3, 4 and 5 were annealed at 900°C for 15 minutes. For the second set, R was 2 and 4 with samples annealed at 1100°C for 2 hours. Both sets are thermally treated in nitrogen ambient. Nanocrystalline formation and layers thickness were assessed by scanning electron microscopy (SEM). The presence of Nd2O3, Si, oxygen (O) and phosphorus (P) was confirmed by secondary ion mass spectrometry (SIMS) indicating also a good post-annealing depth-diffusion of P in the Si bulk and the formation of the p-n junction. Moreover, X-ray diffraction (XRD) was employed to determine existing Nd2O3, SiN and Si phases in the bilayers. Using XRD data, we estimated Si crystallite size to be 6.82 nm. Clear Nd-related room-temperature photoluminescence (PL) emissions were observed for all samples whatever the excitation wavelength. The most intense PL signal at 1083 nm associated with the 4F3/2 → 4I11/2 intra-4f transition is related to Nd3+ ion and belonged to a sample prepared at R=4 and annealed at 1100°C for 2 hours.

Characterization of cordierite/mullite composites prepared by sol-gel technique

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Abstract: Ceramic composites were produced using a sol-gel technique. amount of cordieite (25 wt.%) were added to the mullite, and the calcined gels were sintered at 1480 C for 1 h. The phase composition and sample morphology were evaluated via X-ray diffraction (XRD) and scanning electron microscopy analysis. The sintering parameters in terms of bulk and apparent density were determined. the thermal expansion coefficient (TEC) and mechanical properties were also evaluated. The sintering parameters in terms of apparent and bulk densty were calculated.

Synthesis of graphene from graphite rods recycled from electrical storage devices -Microwave treatment effect

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Abstract: . Despite their use, batteries cause a significant environmental risk due to the toxicity of certain of its components. Future generations' access to battery production is threatened by the usage of materials derived from non-renewable resources. Recycling, however, allows us to control this now.

The synthesis of graphene in both high quality and quantity via economic ways is highly desirable and meaningful for practical applications. In this study, we present a simple and low-cost method for producing graphene. Here, graphite is recycled from storage devices which electrochemically exfoliated as part of the production process. We employed sulfuric acid and water as the electrolyte. The graphene obtain had undergone treatment microwave to re-exfoliate it to obtain more pure graphene (GE-MW). SEM analysis shows that as prepared graphene has homogenise structure microscopy and large intact GE and GE-MW sheets entangled on top of each other. Raman analysis shows the existence of D and G bands confirms the formation of graphene with fewer defects and crystalline structure.

Smart membrane absorbing electromagnetic waves based on polyvinyl chloride/graphene composites

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Abstract: The rapid proliferation and intensive use of electronic devices have led to an increase in electronic pollution, such as electronic noise, electromagnetic interference (EMI), and radiofrequency interference (RFI), which cause malfunctions of electronic devices. The emergence of efficient EMI shielding materials are necessary for EMI and and they should be durable, lightweight, and cost-effective. Graphene (G) and its composites can serve as better shielding materials against these interferences due to their lightweight and high corrosion resistance. Researchers are still grappling with the need for flexible and scalable smart composite materials to prevent radioactive pollution from electronic devices. The inclusion of next-generation graphene (G) conductive fillers loaded with polyvinyl chloride (PVC) /graphene is the main interest of this study. Due to the absorption-dominated shielding process, the composite has an extraordinarily low percolation threshold and a high shielding efficiency (SE) against electromagnetic interference (EMI).The distribution and dispersion patterns of graphene particles in the matrix phase were validated by SEM electron micrographs. The composite, which contains just 40% graphene by weight, has an EMI SE value of 26 dB in the frequency range of 10 to 15 GHz and is only 2 mm thick.In this case, we believe that promoting a scalable and industrially viable G/PVC composite, which is a novel and strong candidate in the burgeoning field of high-stress electromagnetic shielding applications in the future, is the best option.

Study of the structural, electronic properties of AlP, BP compounds and their Al1-xBxP alloy

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Abstract: In this work, we present a theoretical study of the structural and electronic properties of AlP, BP compounds and their Al1-xBxP alloy, using the augmented and linearized plane wave method (FP-LAPW) based on the theory formalism functional density (DFT). In this approach, the approximation (WC-GGA) was used for the treatment of the exchange and correlation potential. Regarding electronic properties, the EV-GGA approximation was also used. The properties of the ground state such as: the lattice parameter (a), the compressibility modulus (B) have been determined. The band structure of these materials was also obtained. The effect of the composition on the crystalline parameter, compressibility modulus and energy gap was studied for the Al1-xBxP alloy. The physical origin of the 'bowing' parameter in the case of the energy gap was obtained using the Zunger approach. The results are discussed and compared with other theoretical and experimental results. Reasonable agreement was observed.

Forced convection heat transfer in triangular corrugated backward facing step with nanofluid

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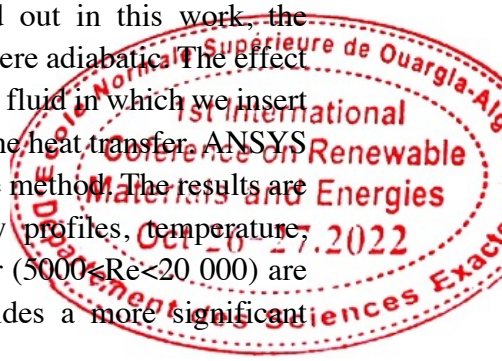
Abstract: In order to reduce industries' costs, heat transfer improvement was the issue of many scientists to minimize energy loss and get performant installations by different technics, one of these technics, is the use of nanofluids in cooling. Forced convection of nanofluid in a backward facing step combined with a triangular corrugated wall was carried out in this work, the downstream wall was heated with uniform heat flux while other walls were adiabatic. The effect of the SiO2 nanoparticle's diameter (10, 20, 30, 40, and 50) and the base fluid in which we insert it (distilled water and Ethylene glycol) were tested in order to improve the heat transfer. ANSYS FLUENT code was used to resolve the equations using the finite volume method. The results are validated by experimental research. Streamlines, isotherms, velocity profiles, temperature, Nusselt number, friction factor, and PEC factor for a Reynolds number (5000≤Re≤20 000) are presented. The results indicate that the SiO2-Ethylene Glycol provides a more significant improvement in heat transfer than Distilled water as a base fluid.



Critical buckling loads of SWCNT under longitudinal magnetic field embedded in Kerr's foundation using NL-EBT

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Abstract: This work presents an analysis of critical buckling loads of a single-walled carbon nanotube (SWCNT) embedded in Kerr's medium under a longitudinal magnetic field using the non-local Euler-Bernoulli model (NL-EBT). Assume that a chemical bond between the SWCNTs and the elastic medium is formed. The elastic matrix is described by Kerr model, which takes into account the normal pressure and the transverse shear strain. Using the nonlocal elastic theory and considering the Lorentz magnetic force obtained from Maxwell relations, the equation of motion for the critical buckling load of SWCNT under a longitudinal magnetic field is derived. the effects of the magnetic field, the non-local parameter, the parameter of the elastic medium, and the aspect ratio of the length to the diameter of CNT are being investigated and discussed. The findings reported in this paper can help researchers and designers develop nanodevices that incorporate mechanical design considerations on CNT.

Modeling of a temperature sensorbasedon plasmonic structures

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Abstract: In this paper, plasmonic SENSOR based on metal–insulator–metal waveguides are proposedand the designed structures are investigated numerically using finite-difference time-domain method. Sensor's transmission spectrum shows an acceptable transmittance. Rectangular adjunctions have been added to the sensor structures to improve their transmissionspectrum. These improved structures consist of air as the insulator and silver as the metal. The relativepermittivity of metal has been described via the Drude, Drude–Lorentz.

Study & improvement of the buildings thermal insulation for better energy efficiency: Ouargla region

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Abstract: One of the qualities of the desert regions in Algeria is hot climate and the long summer period, which results hug consumption of energy in buildings, which in turn has negative aspects in the energy and economic side of the consumer, because of that humans since ancient times created the thermal insulation in their living buildings .

In our research we talked about the thermal insulation of buildings, where we showed the types of insulation and the types of insulating materials, and we also touched on experiences in the city of Ouargla, where was there an application of some types of insulation, which was followed by a simulation on the TRNSYS program

Study of the structural, electronic and optique properties of the perovskite LiTaO3 with the rhomboedric structure

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Abstract: First principles calculations are performed using the fp-lapw method, implemented in the wien2k code based on the dft. The method was applied to study the structural, electronic, optic and thermoelectic propertis of the perovskite litao3 with the rhomboedric structure. The lattice parameter optimisation, the compressibility modulus b and its derivatives b' are computed by the generalised gradient approximation of perdiew burke-enzerhof (96), pbeso-gga (2008), and the density approximation of local spin (lda) . The material shows the paramagnetic character and the value of the lattice parameter is in good agreement with the experiment . Band structure and state density analysis show that litao3 is a semiconductor with direct gap along the direction γ equal to 3.75 ev, which is shown by the opical gap equal to almost 3.8 ev.

Piezoelectric effect in strained III-nitride alloys

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Abstract: III-nitride alloys have emerged as attractive candidates for piezoelectric applications due to their efficient electromechanical conversion. We show in this communication that a promising avenue to enhance this conversion is by tuning the chemical composition of the alloyed compounds. In particular, we investigate the influence of alloy compositions x and y on the piezoelectric polarization of the ternary alloys AlxGa1-xN and InxGa1-xN and the quaternary alloy AlxInyGa1-x-yN. The alloys studied here are lattice-matched to underlying substrates in order to generate the applied biaxial strain and hence giving rise to piezoelectricity in these systems. It is found that the piezoelectric polarization of AlGaN and InGaN increases nonlinearly with the Al and In content x, as it deviates from the linear behavior predicted by Vegard's law. The polarization of AlInGaN is also nonlinear and quite large (larger than that of AlGaN and InGaN), which is desirable for the development of electronic devices, such as high electron mobility transistors. The simulation is performed by the WIEN2k code in the context of density functional theory (DFT). The electric polarization is calculated with the Berry phase approach using the BerryPI implementation of this method as available in WIEN2k.

High-k material gate effect on power consumption, and reliability enhancement of ultra-thin- DG-FinFET transistor for RF applications

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Abstract: FinFET transistors are currently being developed in various research centers (Intel, Global Foundries, Samsung, IBM, and TSMC), and most of these companies have shared fabrication details for 10 nm and 7 nm-node technology [1-2]. Several companies had the goal of improved performance, which was regarded as one of the most important steps toward continuing the downscaling to 4-nm in 2025 [3-4-5]. In this work, The 5nm-DG-FinFET technology is investigated with high-k gate dielectric material TiO2 using 3D-TCAD-SILVACO tools. The significance of high-frequency RF performance parameters includes parasitic capacitances: gate-to-drain (Cgd), gate-to-source (Cgs), and cut-off frequency (ft), maximum frequency (fmax) were compared of the proposed devices DG-FinFET and SG-FD-SOI-MOSFET for examining its reliability. The results showed that using TiO2 (k = 85) as gate dielectric material produces better performance and excellent RF characteristics. It discovered that the proposed device is the most compatible for improving device efficiency (reliability, lower power consumption, and faster circuit) for the future of nanoscale devices due to the using of the high-k gate material TiO2, as well as a shorter gate (Lg= 5 nm). Additionally, it is concluded that the ultra-short DG-FinFET provides an improved RF performance than the SG-FD-SOI-MOSFET, and the parasitic capacitances that deteriorate the performance of the device at high frequency are significantly reduced compared to the SG-FD-SOI-MOSFET. Also, the cut-off frequency (ft) and maximum oscillator frequency (fmax) are significantly enhanced, which making DG-FinFET a suitable candidate for manufacturing process of RF applications and for the amplification purpose.

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Simulation of Electronic Properties of Materials using Quantum Espresso: Application to Silicon and Functionalized Graphene.

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Abstract: In this study, we use density functional theory (DFT) with Quantum espresso package to perform several calculations. Our work focuses on studying the electronic properties of some materials and molecules. For example, we will consider the calculation of bound length and energy absorption of hydrogen. We will also calculate the electronic properties of silicon bulk (Si) and graphene monolayer. We predict the band structure of graphene synthesized by absorbing group IV atoms, such as oxygen, which form covalent bond with graphene and form shape a buckled structure.

AB-initio calculations of structural, electronic, elastic and thermodynamics properties of Rh2CuGe full-Heusler alloy

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Abstract: The study of the fundamental properties of the Rh2CuGe full-Heusler alloy is predicated on the examination of the structural and electronic properties of this compound. Our calculations were performed with the ab initio code Wien2k [1], using the self-consistent full potential linearized augmented plane (FP-LAPW) method [2], based on the density functional theory (DFT) [3], with the generalized gradient approximation(GGA) to determine the equilibrium properties, the electronic properties, elastic constants and thermodynamic properties of this compound. The analysis of structural properties shows that the cubic structure L21 (SG: 225) makes the ground state of Rh2CuGe full-Heusler alloy, the study was carried out in both ferromagnetic (FM) and non-magnetic (NM) phases, this compound was found to be more stable in the non-magnetic phase in this structure at equilibrium lattice constant a= 6.001 Å, in addition, the electronic properties revealed the metallic character of Rh2CuGe full-Heusler alloy.

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Electronic, thermo-elastic and lattice dynamical proprieties of CeSn3

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Abstract: The lattice dynamical calculations have been performed on L12-type (space number 221) of intermetallic compound CeSn3 using the density-functional theory within the generalized gradient approximation (GGA). Beside the basic physical parameters such as lattice constant, bulk modulus, elastic constants, shear modulus, Young's modulus, and Poison's ratio;the phonon dispersion curves and corresponding one-phonon density of states (DOS) are also calculated for the same compound. The temperature and pressure variations of the volume, bulk modulus, thermal expansion coefficient, heat capacity, and Debye temperature in a wide pressure (0–20 GPa) and temperature (0–1000 K) ranges are presented in this study. In particular, our structural parameters (the lattice constant and bulk modulus) are consistent with the available.

Effect of deformation on the electrical mechanical, and structural behavior of copper wire (DUCAB) of electric cables.

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Abstract: This study is proposed as part of a scientific collaboration with the ENICAB electric power transmission cable manufacturing company in Biskra. The aim of this work is the study of the effect of plastic deformation by wire drawing on the evolution of the mechanical, electrical and structural properties of industrially cold drawn copper wires. Our study was carried out on a type DUCAB copper wire rod, the most used by the company ENICAB in the manufacture of cables. A variety of experimental measurement and characterization techniques have allowed us to carry out this work. These are optical and electron microscopy (MO / SEM), backscattered electron diffraction (EBSD), microhardness measurements and tensile tests. It has been noted that the drawing of copper wires causes a fibrous texture to develop along with hardening of the material with deformation. This texture resulting from the deformation is mainly composed of the fiber <111> majority // ND (ND // drawing axis) and the fiber <001> minority // ND (ND // drawing axis) whose acuity both fibers increase with the rate of deformation. The fiber <001> // ND consists of a reinforcement {001} <110> which is convoluted with the component {001} <120>. On the other hand, it is found that the fiber <111> // ND consists of a main reinforcement of the component {111} <112>, this component is very marked and extends on each side to the component {111} <110 >, but, on the other hand, a decrease the plasticity of drawn wire, that is to say its elongation at break and its ability to deform is noted [1-5].

Influence of chemical polishing solution on surface quality

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Abstract: In optical surfaces treatment, several technics are used in the field. Different problems were found when using the variuous technics, especialy the subsurface damage. For that some new solutionswere proposed to ovaid this problem. In this way, our work aims to prepare smooth surfaces using chemical solution to realise fine surfaces of two types of glasses (flint and crown). During the process, the influence of the polishing parameters on the optical surfaces quality was investigated. Dissolution rate, roughness and optical transmission were measured and results were discussed. Obtained results permits to conclude that the polishing solution influences considerably the surface quality.

Dynamic behavior of laminated composite plates

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Abstract: In the present study, cross ply laminated composite plates are considered and a simple sinusoidal shear deformation model is tested for analyzing their dynamic behaviors. The model contains only four unknown variables that are five in the first order shear deformation theory (FSDT) or other higher order models. The in-plane kinematic utilizes undetermined integral terms to quantitatively express the shear deformation influence. In the proposed theory, the conditions of zero shear stress are respected at bottom and top faces of plates without considering the shear correction coefficient. Equations of motion according to the proposed formulation are deduced by employing the virtual work principle in its dynamic version. The analytical solution is determined via double trigonometric series proposed by Navier.Natural frequencies and critical buckling forces computed using present method are compared with other published data where a good agreement between results is demonstrated.

Structural and microstructural study of nanomaterial CuCoCr prepared by mechanical alloying

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Abstract: The nanostructured CuCoCr powder, is synthetized by mechanical alloying from elemental Cu, Co and Cr micrometre sized powders by mean of Fritsch Pulverisette 7 planetary spherical mill. This study investigates the milling time impact's on the development of structural and microstructural parameters. Rietveld analysis of X-ray diffraction patterns is used to obtain phase composition and structural and microstructural parameters such as, lattice parameters, average crystallite size , microstrain and stacking faults probability (SFP) have been obtained in the formwork of Highscore and MAUD softwares.

Study of the removal of a basic dye from a material of biological nature

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Abstract: Renewable resources are materials that can be renewed and exploited after human use such as wastewater. The pollution of wastewater from industrial discharges is a serious problem in many countries. In this study we tested the adsorption of methylene blue (BM) by a material of biological nature and studied the effect of equilibrium time (3min to 60min) and concentration of BM solution (20 to 120mg/l) in an experimental chamber for adsorption optimization. the second order kinetic law best describes the adsorption process,.the adsorption capacity under these conditions 83.87mg/g show that the posibilty of using this material to remove dyes from aqueous solutions.

Surface Metal Effect on Barrier Height in Homogeneities in a Ti/SiC-6H Schottky n-type Diode

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Abstract: The semiconductor industry is interested in materials that can fulfill the required conditions in the areas where silicon cannot fulfill the specifications such as for example applications in power electronics and microwave and applications in the field of photovoltaics. Due to its wide bandgap, good thermal conductivity solid silicon carbide SiC is an innovative success in components that operate at high temperatures. However, the investigation and control of the interface between metal and SiC are the main subjects for SiC Schottky diodes nowadays. This study presents a Ti/SiC–6H Schottky Barrier Diode (SBD) characterization. Three kinds of diode's dimensions have been used. For the small one, the I(V) characteristic at various forward voltage bias is showing adouble-barrier phenomenon, which can be identified as abnormal current under low forward bias. At various temperatures , the I(V) measurements can allow us to understand various aspects of conductivity mechanisms.The electronic properties of the Schottky diode were reported by the analysis of I(V) characteristics as a function of temperatures going from 77 K to 500 K. At low temperature when T < 100 K, the high part ideality factor nH were close to 2, also the values of low part ideality factor Nl varied from 2.69 down to 1.89; one explains this behavior by the fact that at low temperature, the electrons possess a weak kinetic energy KT, and that they prefer to pass the low barrier. The mechanism of conduction is probably dominated by generation-recombination current

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Distribution of electric field lines in the system with hyper-insulating barrier under strong AC voltage

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Abstract: The main objective coveted through this paper consists in studying the field lines' distribution of a rod - plane system with superhydrophobic barrier using the software COMSOL multiphysics version 5.4, and the search of its electrical performance under conditions of severe pollution and alternating voltage 50 Hz. Our investigation is focused on an air gap with a basic non-uniform electric field: rod - plane with flat barrier in contact with the rod or tubular enveloping the rod under alternating voltage, the length of tube and the interelectrode distance are variable. This study was supported by experimental tests carried out at the high voltage laboratory. An experimental device, composed of two supports nested one inside the other in order to allow the simultaneous variation of the interelectrode distance and between the barriers was made. The air gap disruption tests of the two systems with heavily polluted barriers were supported by visualization of the path of their electrical breakdown. A perfect equivalence has been established between the experimental and numerical study. Better system performance was obtained with the use of hydrophobic tubular barriers of considerable length.

Breakdown characteristics of dielectric barrier under AC voltage

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Abstract: The main objective of this work is to study the resistance to electrical discharges of various types of insulating material existing in the high voltage laboratory. The latter are used as dielectric screens in tubular form to improve the efficiency of a system with non-uniform electric field (rod- plane) under industrial voltage. For comparison, five types of insulating materials were used for the manufacture of these barriers: Glass, Polyethylene, Polypropylene, Silicone and a new material recently discovered and produced in our laboratory which is the superhydrophobic material. The numerical and experimental studies are carried out on rod plane air gap, with variable interelectrode distance. A layer of pollution is applied to each material inorder to study the system's performance in the worst case, and the impact of this polluting layer deposited on the insulating barrier's surface. The tests on the disruption of the air gap of this system with highly polluted tubular barriers were supported by a visualization of their electrical breakdown path. According to the results emanating from this research, under contaminated atmosphere, the system with hydrophobic barrier is more rigid than that with hydrophilic orpolymer barrier; which means that a device containing the rod-plane system can be greatly reduced through the use of this type of material. Moreover, it is to be noted that the use of the superhydrophobic material is a good solution

DFT study of highly correlated systems under pressure

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Abstract: The metal-insulating transition of Mott (TMI) is one of the major questions of condensed matter, where the interactions between the electrons of a conductor become strongly correlated and localized to the atoms of the crystal. As this transition corresponds to the emergence of antiferromagnetism, Mott's insulations are considered important not only from a fundamental point of view but also for the new technology of electronic devices. We will use the theory of density function (DFT) with a particular exchange-correlation treatment to study IMT under the effect of hydrostatic pressure. Indeed, the objective is on the one hand to consolidate our fundamental knowledge on this IMT and on the other hand, to predict new Mott insulating materials with specific properties.

Structural, electronics properties of sodium based fluoroperovskites NaCaF3: First principles calculations

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Abstract: NaCaF3 is a typical fluoroperovskites, this compound is found to be in a stable shape with a cubic pm3m structure, according to the findings. In this work, the first-principles calculations are carried out using the full-potential linearized augmented plane-wave (FP-LAPW) method as implemented the code WIEN2K to study the structural properties in order to obtain the lattice optimization parameters, the electronic structure and thermodynamic properties of cubic perovskite NaCaF3.

Numerical modeling of a carbon dioxide (CO2) sensor based on a thin layer of zinc oxide (ZnO)

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Abstract: Semiconducting oxides play a vital role in the field of gas sensors. The thin film approach is useful to make a device small from which it can give improved sensitivity, less response time, and many more benefits arise when we miniaturize the device structure. Zinc oxide (ZnO) is a rough material with many commercial applications like piezoelectric devices, SAW devices, light emitting diodes, catalysts, transparent electrodes, varistors, gas sensors etc. ZnO has characteristics such as high mobility, high chemical stability, non-toxic nature, cost-effective material, high thermal conductivity, wide band gap, high exciton binding energy and many more. This work describes the modeling and analysis of a Zinc Oxide thin film-based CO2 sensor. The conductance and sensitivity of the sensing layer have been described by a change in temperature and a change in CO2 concentration. The analysis has been done for reducing and oxidizingagents. Simulation results revealed the change in resistance and sensitivity of the sensor with respect to temperature and different CO2 concentrations. To check the feasibility of the model, all the simulated results have been analyzed to confirm experimental work.

The Effect of Earth Current in the Variation of Lateral Profile Magnetic Field under High Voltage Overhead Transmission Line

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Abstract: The electric power transmission is accompanied with generation of low –frequency electromagnetic fields. Nowadays of particular concern is the possibility of detrimental environmental effects arising from the electric and magnetic fields induced neighboring to high voltage overhead power lines. These fields may affect both operation of near electrical and electronic devices and also various living organisms. The study presents in a instructional design technique for the calculation of magnetic fields in vicinity of overhead electric transmission lines without and with exiting guard wire currents at a desired point above ground level. Exact method of the computation of the magnetic field of a straight parallel conductor based on the image method is presented. The decomposition of the magnetic fields in two components: magnetic field obtained in free space from the Biot-Savart law and the magnetic field produced by earth current is discussed. It is shown that in practical cases the effects from earth currents can beneglected as compared with effects from line currents.

Design guidelines of InGaN nanowire arrays for photovoltaic Applications

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Abstract: Compound III-Nitride semiconductors (InN,GaN and AlN) and their alloys are widely used materials in optoelectronics fabrication of light emitting diodes LEDs and laser diodes LDs . In photovoltaics, however, III-Nitrides are less used compared to other semiconductors (silicon, cadmium Telluride , chalcopyrites,...) despite their potential to convert most of the solar spectrum to electricity and their ability to with stand high-temperature and ionising radiation.

This work aims to find the optimal design of the InGaN nanowires. Firstly, a detailed balance analysis was performed to show the importance of using InGaN materials to effectively convert the light to electricity, followed by an optical modelling to point out the advantages of using periodic nanowire arrays in designing solar cells. From the detailed balance analysis, it is expected that single junction solar cells made from In0.63Ga0.37N alloy result in the highest light-to-electricity conversion efficiency of 31%, and the Rigorous Coupled Wave Analysis RCWA simulations show that nanowire arrays made from InxGa1-x N fractions (x values) ranging between 50 and 77% alloys may achieve efficiencies of more than 33%, with a maximum efficiency of 37.7% for In0.67Ga0.33N NW array. Substrate choice, array density and filling material impacts on device performance were also studied.

Synthesis, characterization and photocatalytic behavior of Zn doped SnO2 thin film

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Abstract: in this work, the influence of Zn concentration on microstructural and optical properties of SnO2 thin films is investigated. Pure and Zn-doped SnO2 thin films were prepared by sol–gel dip-coating deposition method onto glass substrates. The molar ratios of [Sn] / [Zn] were 0, 0.2, 0.4, .0.6, 0.8 and 1, these films were named as un-doped SnO2, SnO2: Zn (0.2%), SnO2: Zn (0.4%), SnO2: Zn (0.6%), SnO2: Zn (0.8%) and SnO2: Zn (1%) respectively. The deposited films were dried at 400°C for 10 min and finally annealed at 500°C in air for 1 hour. The films were analyzed by X-ray diffraction (XRD), atomic force microscopy (AFM) and UV–VIS spectroscopy. X-ray diffraction analysis confirms that all films crystallize within the tetragonal cassiterite SnO2 structure as confirmed by Rietveld method. The AFM images show homogeneous surfaces for all samples as such the AFM analysis reveals that the surface morphology changes with Zn concentration; the roughness was found to increase to reach an optimum value around 14 nm then decrease upon Zn loading. The optical measurements indicate that the un-doped and Zn-doped SnO2 thin films are transparent (89-97%) with a good transmission in the near UV-Vis. The photocatalytic activity of SnO2 thin films upon Zn doping for the degradation of methylene blue reaches ~ 90% under UV light.

Stimulated Raman and Brillouin scattering in a linear cavity

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Abstract: The non-linear effects such as Stimulated Raman Scattering (SRS) and Stimulated Brillouin Scattering (SBS) can generate spatial-temporal instabilities that can lead to a drastic degradation of the performance of these laser sources, it can reach the multi-kW level and subsequent induce irreversible damages in fiber laser systems [1, 2]. The study and the control of these scattering could allow to increase the performances of these systems. This contribution explores theoretically the dynamic behaviour of rare-earth ytterbium-doped fiber laser in the presence of inelastic scattering such as SRS and SBS. These two mechanisms are manifested through the generation of a backward and forward propagating Stokes wave, respectively, that carries most of the input power. A space-time model is developed to describe the interactions between Laser, Raman and Brillouin waves in order to better match with experimental observations, the model here includes the influence of the amplifying medium (Yb-ions) through the population inversion equations. We also consider a matter equation to account for the saturable absorption effect which can occur in the un-pumped segment of the active fiber. Here, we consider the simplified Fabry-Perot fiber laser cavity, comprising a single-mode fiber doped with ytterbium and two plane mirrors of reflectivity R1 and R2. The coupled amplitude equations describing the spatio-temporal dynamics is solved numerically using a fourth-order Runge-Kutta algorithm for the time domain and a finite difference algorithm for the spatial domain. It has also been shown in the previous experimental work that the peak powers of the short pulses generated through cascaded SBS could reach the Raman threshold intensity [2]. For a pumping rate higher than the Brillouin threshold, pulses of a few nanoseconds are observed, which consist of a train of pulses. Their statistical splits into a double distribution and no longer has an exponential shape as obtained in ref [2]. The second distribution, which contains a large number of pulses, which is not obtained in the results of previous numerical simulations [2].

Synthesis, characterisation and antibacterial activity of composite films biopolymer – silver nanoparticles

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Abstract: The technological advances of recent years in nanotechnology have led to the development of new materials which have applications in all fields: water treatment, in catalysis, chemical detection and more particularly as antibacterial agents in various fields such as the food industry or the biomedical field. For some time now, the antimicrobial properties of silver nanoparticles have been proven.These nanoparticles can be incorporated into polymer materials and promoted as antibacterial agents. A new alternative that has broadened the prospects of their applications by simultaneously meeting biocompatibility requirements has been the use of biopolymers: this has paved the way for a promising result for biotechnology. In the present work, biocomposite films were synthesised and then characterised by different analytical techniques, such as solid state UV-visible spectroscopy, FTIR infrared spectroscopy and TG-ATD thermal analyses. These films were tested against pathogenic strains.The results were very satisfactory and highlighted the antimicrobial and antifungal activity of the synthesised biocopmosites.

Thermal Behavior of an Algerian Building Envelope Integrating a Hybrid Phase Change Material under Mediterranean climate

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Abstract: Latent heat storage using phase change materials helps improve the energy efficiency of building. The purpose of this study is to analyze the thermal behavior of a building envelope wall with an inner coating layer of hybrid PCM and plaster using the South Mediterranean climatic conditions. The phase change is carried out at two different temperatures. A mathematical model based on the enthalpy method is proposed and implemented to describe and analyze the dual phase change that occurs at two temperature levels. A computer code is implemented based on a fully implicit scheme to analyze the effect of PCMs content in the wall. Simulation results show that the climate affects the cooling load in summer. The use of coating layers of plaster and hybrid PCM on the inner face of the envelope reduce the amount of heat flux into the building during the day and contributes to the reduction of the internal temperature and the peak of cooling load, which leads to reduce the electricity consumption used to ensure thermal comfort inside the building.

Li2Cu(WO4)2@Ag Nanoparticles as Anode with Superior Electrochemical Performance for Supercapacitors

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Abstract: With the fast development of science and technology, highly effective energy storage devices (ESDs) such as batteries and supercapacitors have fascinated extensive interests owing to the escalating demands in diverse applications [1,2]. In this study, we readily prepared Li2Cu(WO4)2 decorated with silver nanoparticles (Ag NPs@LCW) for use as an effective positive material in asymmetric supercapacitors (ASCs). With the help of citric acid as a chelating agent, Li2Cu(WO4)2 was synthesized by a one-step self-combustion method. Then three composites of Li2Cu(WO4)2 decorated with different contents of Ag NPs (10, 20 and 30%) were prepared. The obtained Ag NPs are directly reduced from AgNO3 by ethanol and PVP, which can improve the ion transfer rate of Li2Cu(WO4)2. The synthesized composites were characterized by FT-IR, XRD, XPS and SEM+EDS. Then, the electrochemical performance was evaluated by cyclic voltammetry (CV), electrochemical impedance spectroscopy (EIS), galvanostatic charge-discharge (GCD) and cyclic stability studies. The mechanism of ion intercalation behavior with different Ag content were studied. The results showed that the Li2Cu(WO4)2 electrode with 30% silver content had better electrochemical performance (1579 C/g at 5 A/g and also had excellent retention capacity of 89.2% after 10,000 cycles at 40 A/g, indicating that Ag NPs have positive effects on the electrode capacity. In addition, an asymmetric supercapacitor device composed of Li2Cu(WO4)2@Ag30 electrode as anode and α-MnO2/rGO cathode was realized and improved a high energy density of 124.3 Wh/kg at a power density of 900 W/kg as well as an excellent retention capacity (84.8%) after 10,000 cycles at 10 A/g.

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Optimization on composite material using solidworks simulation in the case of tensil test.

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Abstract: This work is concerned with the modeling of plates in composite materials using solidworks simulation for the study of these plates under different types of loadings and the analysis of stresses and deformations generated by these stresses. It also consists of optimizing the composite structures studied by setting multiple objectives, namely reducing the weight, stress or displacement required, depending on the design variables, particularly the thickness of the plies, their orientations and the materials used.

Comparative study of the structural and electronic properties of pure and doped MO (M=Mg, Zn): DFT

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Abstract: Numerous theoretical and experimental approaches have been done on ZnO, MgO pure and doped. First principles calculations within framework of the density functional theory (DFT) have been carried out to investigate a comparative study of the structural, and electronic properties of zinc-doped magnesium oxide (MgO-Zn) and magnesium-doped zinc oxide (ZnO-Mg). Hubbard+U was used in GGA functional implies viable method in correcting the calculation of electronic properties of Zn-MgO, and Mg-ZnO. The crystal structure used in this calculation was cubic MgO and wurtzite ZnO with supercell of 2x1x1. The density of states and the band structure were calculated and compared with those of the bulk (ZnO/MgO). Finally, we discuss the band gap dependence on the U Hubbard potential and compare our results to the experiment. In addition, this information could provide a direction in synthesizing good photocatalyst material and make it promising in optoelectronic devices, especially in solar cell applications

Structural and Microstructural Study of Binary Iron Based Alloy Prepared via Mechanical Alloying

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Abstract: The binary Fe90Co10 alloy system was prepared via high energy ball mechanical alloying (MA) of pure metals Fe and Co and under an argon atmosphere. The alloying was carried out for several periods (0h, 1h, 3h, 6h, 12h and 24h) in order to follow the phase evolution. The X-ray diffraction technique was the main used tool to investigate the structural and microstructural properties of alloyed samples via the Rietveld refinements of the obtained XRD patterns. It has been found, that while milling time increases, the elemental peaks of Co gradually decrease in intensity until vanishing completely, while those of Fe remain exist resulting in the development of new nanostructured solid solution in the Fe-bcc structured matrix. The solid solution creation is essentially due to the severe introduced plastic deformations by MA and the incorporation of Co in the Fe host-lattice. As a result, a large number of structural defects such as dislocations and grains boundaries are manifested inside the alloyed powders' particles leading to the distortion of the lattice parameter. This latter attain a value of ~0.31222 nm after 48h of milling. In addition, the crystallites' size continues to decrease with milling time reaching a minimum of ~14.47 nm at the end of milling. Meanwhile, the rate lattice' strain increases up to ~0.423%

Fabrication of lithium orthosilicate sorbents from diatomite for co2 uptake

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Abstract: The emissions of greenhouse gases in the air especially Carbon dioxide (CO2) considered the most concerning threat to the world and the major problem contributing to global warming and climate change [1]. Therefore, the capture of CO2 becomes a great challenge facing the scientific community to minimize the negative impact on the environment.

Several high-temperature adsorbents are used, Lithium orthosilicate (Li4SiO4) has been identified as one of the most promising candidates for CO2 capture at high temperatures [2, 3].

Numerous silica sources are operated in order to fabricate lithium orthosilicate among them the natural source diatomite which attracts attention due to many advantages including the low cost, the non-toxicity, and the low density. In addition, diatomite presents a high porosity, high surface area, and small particles enriched in amorphous silica.

In our work, we study the adsorption of CO2 over our solid sorbents which were prepared via reactive calcination at 700 °C under atmospheric air for 4h according to the following reaction:

$$2Li_2CO_3 + SiO_2 \rightarrow Li_4SiO_4 + 2CO_2$$

Li4SiO4 is synthesized by the solid-state reaction method using Lithium carbonate (Li2CO3 supplied by Fluka with a purity of 99%) as lithium precursor and the Algerian diatomite (as a source of SiO2 with more than 73%)

Phase compositions of obtained adsorbents were detected by the XRD test, it is found that the diffractogram is mainly composed of Li4SiO4 phase peaks.

The adsorption isotherms of CO2 are obtained using gravimetric analysis in the range of 400-500 °C at various flow compositions (0-100% of CO2 in N2), The results show that the amount of CO2 adsorbed increases with temperature and the obtained adsorption capacity of CO2 is more than 6 mmol/g which improve that Li4SiO4 derived from diatomite is a potential candidate for CO2 capture at high temperatures.

Valorisation of recycled SiC from cutting fluid for the manufacture of a ceramic membrane

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Abstract: Inorganic or ceramic membranes, compared to polymeric membranes, are more resistant to pressure, high temperatures and very aggressive pH environments (0-14). They have a high permeability allowing them to reach the required water quality without generating risks of clogging or reduction of the permeability with a great thermal stability and mechanical resistance which gives them the advantage of being able to be sterilized with hot water or steam [1]. On the other hand, the cost of the membrane can be compensated by a high ratio of resistance/density and modulus of elasticity/density, a life span that exceeds five times that of organic membranes as well as the exploitation of recycled products and low cost raw materials.

Our work consists in the realization of a ceramic composite membrane based on the unique silicon carbide (SiC) technology. First, the used SiC from the waste cutting fluid of silicon ingots in wafers was recycled by different chemical separation methods (phase transfer, alkaline dissolution and vacuum filtration) [2]. The SiC-based membrane support was realized by sintering at 800°C by optimizing the sintering conditions (temperature, choice and concentration of sintering additives (binder, plasticizer, pore-former...). These additives have the role of improving the characteristics of the mechanical support of the membrane

Influence of the laser power on the return photon flux of a laser guide star LGS

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Abstract: Adaptive optics (AO) systems based on sodium laser guide star became an essential tool for giant ground telescopes such as VLT and E-ELT of the European Southern Observatory. This type of systems can generate bright spot which we call an artificial star at high attitude (around 80 to 100 km) serves as a reference source in the AO systems to correct the wave-front distortion induced by the atmospheric turbulence. The brightness of the artificial star plays an important role in the astronomical observation process. The objective of this work is to study the influence of the lase power on the generation of laser guide star (LGSs).

Elaboration, Structure and morphology of the FeCo-10%Cr nanostructures: Effect of milling time

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Abstract: Mechanical alloyed (Fe70Co30)90Cr10 powder mixtures have been investigated using 57Fe Mössbauer Spectrometry [1;2], X-ray diffraction (XRD) and scanning electron microscopy (SEM). In this study, the effect of milling time (6, 12, 18, 24, 48, 60 and 72 h) has been investigated. XRD result revealed that the lattice parameter varies from 2.8614 up to 2.8665 Å. According to Rietveld refinement [3], we found that the phase hcp-Co and fcc-Co disappeared after 24 h of milling time, and we evidenced the existence of FeCoCr solid solution from 6 h milling time. A change in the shape as well as the size of the particles as a function of the milling time was noticed. The EDX spectra allowed us to check the chemical composition of the powders produced and to provide information on the state of contamination of the alloys.

Investigation of Diffusion Parameters in PN Junction Using Phosphorus Doped Paper Sheets.

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Abstract: This effort will be devoted to the realization of the PN junction by diffusion of solid sources in Tempress oven. During the fabrication process, temperature and deposition time, are altered. At first P type silicon wafers are thinned in a NaOH+H2O bath at an 80°C temperature for 10 minutes to remove approximately 15m to 20m from each face. This is followed by Piranha cleaning, which involves soaking the sample for 10 minutes in a solution (H2SO4 +H2O2), then 10 seconds in a 2 percent diluted HF solution. The samples are therefore washed with deionized water and dried with N2 between each immersion phase and at the conclusion of cleaning. The phosphorus silicate glass (PSG) is subsequently etched off in HF solution. Surface passivation is affected by doping concentration, with lower doping levels allowing for higher passivation quality [2]. In this context, the doping profiles were determined by electrochemical capacitive measurement (ECV) and the SH effect technique, and the results of the numerical calculation were compared with the XPS analyses. Sheet resistance (Rsh) was measured using a four-point probe and life is measured with the QssPC technique.

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Grid connected hybrid Wind-PV Energy Systems using MPPT algorithm with Battery Backup

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Abstract: This paper presents a method of control grid-connected hybrid renewable energy sources with battery backup using the MPPT algorithm. The main objective is to improve the power transfer capability of grid-connected hybrid generation systems. Generally, this hybrid system is a combination of solar and wind energy systems. Global warming is considered to be one of the most critical environmental problems that people will face in the coming years. Electricity production from renewable energy sources is becoming more and more usable and economical than traditional production systems. The main challenge in using wind and solar energy as a source of energy is that both wind and solar energy may not be available when electricity is needed. Photovoltaic energy is not available at night, in cloudy and snowy weather, and wind energy is not available when there is no wind. The extraction of maximum power from fluctuating sources is a major problem. The maximum power point tracking (MPPT) algorithm is used to solve this problem. The integration of the energy storage system (ESS) to reduce the uncertainty of solar-wind generation will improve the reliability and security of generation. The storage system can play a key role in the generation of energy and thus smooth out variations in the energy produced over a desired time horizon and variations in the power load. The novelty of this paper is to improve the power generation of both the PV system and wind system with enhanced techniques.

Effect of natural phosphate content on the growth kinetics of hydroxyapatite crystals grown from kaolin clay

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Abstract: In the present study, the kinetics of hydroxyapatite formation in different kaolin-natural phosphate mixtures was investigated using X-ray diffraction (XRD) and differential thermal analysis (DTA) measurements. The XRD patterns revealed the presence of both kaolinite and hydroxyapatite phases in all of the mixtures and full disappearing of kaolinite phase in the heat-treated samples. According to the DTA curve results, both the peak temperature formation of hydroxyapatite and the relative fraction-transformed increased as the heating rate increased and the amount of phosphate in the mixture decreased.The activation energy of hydroxyapatite phenomenonwas estimated using Kissinger and Ligero analytical methods. The obtained values of the activation energy were in the range of 196.5 and 210.6 kJ/mol. The growth morphology parameters n and m were both foundto be near to half unity indicating that the surface nucleation with plate-like growth was dominant in hydroxyapatite formation controlled by diffusion.

Calculation of the electric microfield distribution function of a magnetized plasma

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Abstract: The analysis of the physical properties of an atomic system within a plasma suggests the introduction of perturbation theory into the formalism of quantum mechanics. The plasma as a whole must also be treated by statistical mechanics to reduce the very high number of degrees of freedom of the system. An important example is the calculation of an emission or absorption line profile for a transition in the atomic plasma system. These theoretically calculated line profiles are useful for diagnosing the temperature and density of plasmas.

Often, all the effects of plasma disturbing ions on an atom can be treated as a uniform electric micro-field produced by all plasma ions even in the case of the presence of a magnetic field.

Schrödinger's equation for different potentials using different definitions of the fractional derivative

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Abstract: Although the application of Fractional calculus has attracted interest of researches in recent decades, it has a long history when the derivative of order 0.5 has been described by Leibniz in a letter to Hospital in 1695. Fractional calculus is the calculus of derivatives and integrals with arbitrary (real or even complex) order, which have found many applications in recent studies to model a variety processes from classical to quantum physics.

Nowadays, application of the fractional calculus to quantum processes is a new and fast developing part of quantum physics which studies nonlocal quantum phenomena. Nonlocal effects may occur in space and time .In the realm of non-relativistic quantum mechanics , Schrödinger equation represents a fundamental equation to study many quantum processes.

The Schrödinger equation is a partial differential equation that describes how the quantum state of a physical system changes over time. This equation is of particular importance in quantum mechanics, as it is considered as Newton's second law of motion, which is fundamental in classical physics. In this paper I have plotted the steps that must be followed in order to derive the exact Schrödinger equation for a particle using several potentials. To this end, I used the fractional derivative as defined by Fabrizio Capito.

Etude des Paramètres des Performances d'un Distillateur Solaire de Type Chapelle

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Abstract: Our work consists in studying experimentally and theoretically a chapel-type solar still. Distilled water production tests were carried out using well water with a conductivity . The numerical study of the system by the application of the finite difference method, allowed us to better see the temporal evolution of the temperatures, the variation of the operating characteristics of the distiller such as the internal efficiency, the global efficiency, yield and performance factor.

The program developed was validated by the comparative study of theoretical and experimental results taken under the same conditions. The measurements made by our program under the same conditions with respect to temperatures, solar flux have been verified by measurements made experimentally on a distiller made at the laboratory level with an absorption surface of 1.2 m2 in aluminum and an angle of inclination of the glazing of 15°, under the climatic conditions of the town of Tipasa.

The day of July 15 was chosen for the calculation, the daily productivity in distilled water. During this day the production reached 5.2 liters; under a radiance of 1015.75 w/m2 inducing an ambient temperature of 37.5°C with brine reaching 70.9°C, the rated internal efficiency is 35.23% with an overall efficiency of 53.42% and a performance factor of 2.33.10-4 l/kJ.

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A contribution to a physicochemical study of the sands of the Tamanrasset region

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Abstract: In this work, we study the physical and chemical properties of sand sample from Tamanrasset region by granular classification, FTIR spectroscopy, XRF fluorescence technique, and SEM scanning electron microscope.

Where it was found that the sand of the Tamanrasset region is of a very coarse sand type with a percentage of 29.88%. Also, FTIR analysis showed the presence of quartz (SiO 2) as the main and predominant component in the studied sand sample with the appearance of other compounds Dolomite, Wollastonite, lead carbonate and water compound. The X-ray fluorescence ED-XRF results showed that the sand of the Tamanrasset region contains 63.35% of quartz (SiO 2) and alumina (Al 2 O 3) in good proportion with the presence of other oxides in small proportions. SEM technique and EDX analysis confirmed that the sand sample contains oxygen (O) and silicon (Si) in large proportions indicating the quartz compound (SiO 2) and significant proportions of Al and Fe with small proportions of K, Mg, Ti, Co and Ca.

Physicochemical properties of the Tevernin sands as a potential source of quartz mineral

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Abstract: In order to assess its potential use as a source of Quartz mineral, the present study aims to investigate the physicochemical characteristics of the sands from Tevernin (Illizi), a region of the southern Algerian Sahara, using Fourier-transform infrared spectroscopy (FT-IR), X-ray diffraction (XRD), Scanning Electron Microscope (SEM/EDX), and X-ray fluorescence (XRF). The XRD and FT-IR analysis confirmed the dominance of α-Quartz minerals with a high crystalline nature. However, the XRF results showed the dominance of Quartz in Tevernin sand by 91% of SiO2. Besides very low amounts of CaO (2.8%), Al2O3, and Fe2O3 oxides. Furthermore, the SEM micrographs show the presence of different shapes and sizes of sand grains, with an average size of 116 µm. These results corroborate that Tevernin sands are a good source of quartz, need some enrichment to eliminate impurities and getting the pure mineral.

Sol gel of ZnO pure and Mg doped ZnO thin films: preparation and characterization

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Abstract: Our work focuses on the preparation and characterization of pure ZnO and Mg doped ZnO thin films by the sol-gel spin-coating technique on glass substrates. Results from X-ray diffraction indicated that the films exhibited a hexagonal wurtzite structure and were highly oriented along the c-axis. It was observed that the intensity of the (002) diffraction peak increased with increasing the Mg-doping concentration, due to the improvement in the crystal quality of the film. UV emission peak and three defect emission peaks in the visible region were observed by photoluminescence measurements at room temperature. The intensity ratio of UV-emission to the visible emission increased with the Mg concentration. Optical analysis showed that the average transmittance of all films was above 90% in the visible range and Mg-doping has significantly enhanced the bandgap energy of ZnO. It is worth noting that the fabricated Zinc oxide (ZnO) thin films, which presented good properties, can be used for different potential applications such as solar cells and gas sensors

Investigation of layered LiFeO2-based material for Li-ion battery cathode by DFT+DMFT method

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Abstract: With the award of The 2019 Nobel Prize in Chemistry to the development of lithium-ion batteries, it is enlightening to look back at the evolution of the cathode chemistry that made the modern lithium-ion technology feasible. One of us provide a new helpful bottom up approach for guidance in the search for adequate cathode material in general and specifically lithium ion batteries (LIB), the ab initio calculations of second order for elastic properties and phonons dispersion spectra, and heat capacity of the widely used nowadays LiCoO2 found a good agreement with published experimental data, but for a potential candidate LiFeO2, the one with the same layered structure. The results show a considerable elastic anisotropy (EA) for LiFeO2 compared to LiCoO2 and the hardness is much lower than in LiCoO2, the Debye temperature for LiFeO 2 is lower than for LiCoO2. LiFeO2 phonons dispersion show negative frequencies compared to LiCoO2 which is a sign of structural instabilities. To improve and deepen our understanding of these materials we are using the dynamical mean-field theory (DMFT) method in framework of density functional theory (DFT) methods.

Technico-economic study of a hybrid PV/fuel cell/battery

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Abstract: The access to electricity is an essential component to support the economic and social development of a locality and contributes to reduce poverty.

In this paper, we will present an autonomous hybrid system of production of electrical energy starting from a feeding system made up of various sources.

For the starting of a photovoltaic system based on hydrogen, the sizing and the architecture of the system are a paramount stage in the design and the realization, following that we highlight the costing of the worked out system, in order to feed an electric charge (the research laboratory LAGE at the university of Ouargla) in an autonomous way, these stages are carried out by HOMER beta 2.86. software, the results of simulation, the optimization and the analyses of the system (statement – Electrolyser, FC) are detailed.

Investigation of the optical properties of Fe-doping ZnO thin films

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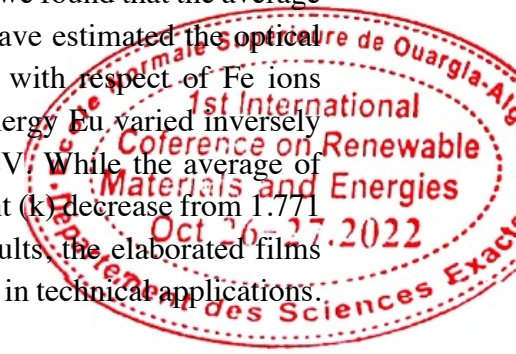
Abstract: In the present study, undoped and Fe doped zinc oxide thin films were prepared by spray pyrolysis techniques on a glass substrate at temperature 350 ºC with the doping concentration ZnO: Fe (0 and 4%). The optical properties of all films were measured by UV–Vis spectrophotometer in the wavelength range varied from 300 to 800 nm. The film thickness (d) was measured by using weight difference method; the measured values are 205.986 and 223.652 nm for 0% and 4% ZnO: Fe content, respectively. From the UV spectra we found that the average transparency increases from 62% to 89% after Fe doping. Also, we have estimated the optical band-gap energy which slightly increases from 3.23 eV to 3.29 eV with respect of Fe ions concentration increases, unlike the calculated values of the Urbach energy Eu varied inversely proportional with the optical band gap energy from 0.095 to 0.085 eV. While the average of optical parameters such as refractive index (n) and extinction coefficient (k) decrease from 1.771 to 1.685 and 0.102 to 0.021 respectively. According to the above results, the elaborated films with high optical transparency are promising for optoelectronic devices in technical applications.



Structural study of rock samples from the Ouargla region using spectroscopic methods

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Abstract: The desert of the Ouargla region is rich in a variety of rocky composition, starting with sand, gravel, grit, to the rocks of small and large size. After conducting the research and excavation process, we discovered the huge amount of diversity and differences in the shapes, colors and structures of these rocks. Where three samples of rocks were studied for the purpose of knowing their components. By using physical and chemical spectroscopy methods, which are considered one of the most important and easiest techniques for structural and quantitative analysis of the studied samples, during our applied study, we used some techniques represented in the X-ray diffraction spectroscopy technique (DRX), X-ray fluorescence spectroscopy technology (XRF), Scanning Electron Microscope (MEB) and Absorption Infrared (FTIR) Spectroscopy. Which turned out that the samples mostly consist mainly of quartz in addition to other chemical elements in varying proportions such as magnesium and silicon in addition to indium and rhodium. The theoretical spectrum of LIBS for one of the samples was also deduced.

Study of the structural and optical properties under the influence of the deposition temperature of the films by chemical bath deposition method

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Abstract: In this work, we did study the structural and optical properties under the influence of heat treatment ofa powder consisting of compounds CHNaO3, Cu, K2CrO4, Magnetic Sample rock, Sample rock it is deposited on glass floors at different deposition temperatures (150°C, 200°C, 300°C), and the prepared by chemical bath sedimentation method in a magnetized medium in the case of magnetic attraction. L have energy dispersion measurements by (EDX) have shown these membranes are made of chemical elements C, O, Na, Al, Si, Au, K, Ca at different temperatures with the appearance of some chemical elements in small proportions this is by increasing the sedimentation temperature, this is because at higher temperatures chemical reactions produce a greater proportion of collisions because a greater proportion of molecules have higher velocities, therefore, new ions are generated and react, resulting in different precipitates, the optical properties of these films were also studied using UV-visible spectrometers by recording the transmittance and absorption spectrum for the wavelength range of nm (900-200), it was found that the optical transmittance increases with the increase in the deposition temperature with the increase in the wavelength which is offset by a decrease in the optical absorbance values, as well as it was found that the absorption coefficient decreases with increasing deposition temperature.

Study the effect of heat transfer fluids on the efficiency of Parabolic trough collector (PTC)

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Abstract: Since the post-industrial revolution, there has been an excessive doubling of the world's energy consumption and the consequent pollution caused by fossil fuel combustion and climate change,putting at risk of environmental balance and depletion of global fossil fuel supplies.

This has led to the thought of exploiting renewable energy sources such as solar energy for sustainable development. Solar energy is currently one of the most important sources of cleanliness moreover renewable energy as the Earth is exposed to about 1.8x1011 MW of solar energy [1], 30% of solar energy actually reaches Earth and every 20 minutes the sun produces enough energy to provide the Earth with its needs for a whole year[2].

Solar thermal energy can be harnessed by using the Parabolic trough callector PTC, which absorbs solar energy and converts it into heat to produce steam in solar thermal power plants to generate electricity and can be used to produce hot water for industrial and domestic purposes.

The latest studies focus on increasing the efficiency of these systems, whether from the structural / material aspects (solid mechanics) and heat transfer (fluid mechanics), in this work the efficiency of the equivalent cylindrical solar condensate has been studied by changing the heat transfer liquid (water, oil) and also the effect of dimensions In order to respond to the required temperatures in the industrial medium.

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Electronic structural and optical properties for Zn1-xMgxO using Ab-initio study

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Abstract: ZnO and ZnMgO are one of II-VI semiconductor materials it has been of growing interest for application in electronics and optoelectronics devices, due to their wide band gap and suitable energy band-gaps. This makes them promising semiconductors for application in the short-wavelength region of visible light.

In the present study, the electronic structural, and optical properties of binary ZnO, MgO and their ternary Zn1-xMgxO alloys, at the compositions (x=0.0, 0.25, 0.50, 0.75, 1.0), in the wurtzite phase were investigated via an ab-initio theoretical study. We use a Wien2k package code based on Density Functional Theory (DFT) Full Potential and Linearized Augmented Plane Waves (FP-LAPW) method including recent Tran-Blaha modified Becke-Johnson correction of the exchange potential (TB-mBJ).

The electronic structural results show that the crystal is a semiconductor with a direct band gap, and the contribution of Zn-3d, O-2p and Mg-3s is prominent in the density of states (DOS). Moreover, the optical properties are also computed, the dielectric function, refraction index, reflectivity, absorption and optical conductivity and the obtained results compared well with the experimental data and previous theoretical results.

Net emission coefficient of H2O-Air thermal plasmas at atmospheric pressure

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Abstract: In our work, we study the radiative transfer in a plasma formed by H2O-Air mixture, and particularly the calculation of the net emission coefficient. The H2O-Air plasma is produced during the analysis of pollutants in water using the LIBS (Laser-Induced Breakdown Spectroscopy) technique, this plasma is often mixed and contaminated with metallic vapors.

This calculation is performed under atmospheric pressure in the temperature range of 5000K to 30000K, for different plasma thicknesses between 0 and 1cm and under the assumption of local thermodynamic equilibrium.

The NEC is the difference between the radiative power emitted in the axis of the arc and the radiation absorbed in other regions of the plasma by a unit of volume, in which it is assumed that the plasma is spherical, homogeneous and isothermal.

The total radiation emitted by the plasma is the result of the superposition of the background continuum and line spectrum, which is itself the result of several processes such as: bremsstrahlung and radiative recombination. For the treatment of the lines by neglecting their overlap in order to make possible the use of the escape factor. The determination of line profiles is essential. To know the profile of a line, it is necessary to study the broadening phenomena.

The results highlight the influence of three parameters on the net emission coefficients: temperature, pressure and plasma thickness. The values of NEC allow the estimations of the radiative losses in the hot regions of the plasma.

The determination of the radiation escaping from the plasma is essential: the radiation is a non-negligible term in the energy balance and its knowledge allows to calculate the radial temperature profile in the arc plasma. This radiation can also be used as a diagnostic tool for the characterization of the plasma.

Improved metal-insulator-transition performance in VO2 Thin Films fabricated by pulsed laser deposition

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Abstract: Vanadium dioxide (VO2) is one of the most promising materials for energy storage and energy conservation applications [1]. Due to its reversible metal to insulator transition (MIT) and the resultant abrupt suppressed infrared transmittance at high temperature, Vanadium dioxide is one of the ideal materials for Energy-Efficient Smart Windows [2], however, the efficiency of such device greatly depend on VO2's MIT proprieties [3]. Here we show that the properties of VO2's MIT can be significantly improved by the incorporation of an oriented ZnO intermediate layer.

In this work pulsed laser deposition (PLD) has been used to successfully grown single phase VO2 thin films on virgin glass substrate with an intermediate oriented ZnO buffer layer. The microstructural features were studied by x-ray diffraction and Raman spectroscopy. The metal-insulator transition properties of the VO2 film samples were investigated in terms of electrical resistance with varying temperatures. The main results show a significant improvement in the reversible metal-to-insulator transition of the films in term of amplitude, width and sharpness of the electrical resistance variation hysteresis.

Propagation of femtosecond solitons in silica fibers

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Abstract: We study the propagation dynamics of femtosecond optical pulses in silica fibers which are the most common type of optical fibers that can be quite suitable for exploiting the Kerr effect and can have extremely low absorption and scattering losses, and can be doped with various materials in order to improve various properties. The higher-order nonlinear Schrödinger equation with quintic non-Kerr terms is used to describe the light propagation in such system. A rich variety of solitary pulse solutions are obtained for the model under certain parametric conditions. The solutions comprise bright, dark, and dipole solitary waves, illustrating the potentially rich set of localized wave solutions of the model. The formation conditions, the existence regions and the features of the obtained solitary waves are also analytically investigated and the stabilities are numerically discussed.

Study of ZnS/ZnO heterostructure,with chemically deposited ZnS

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Abstract: In this study, ZnO has been deposited by electrodeposition in aqueous solution and ZnS thin films by chemical bath deposition method (the deposition was carried out at various bath temperature) on FTO glass substrates. Electronic, optic and morphological properties of the heterostructure ZnS/ZnO were investigated using different analysis techniques. Mott-Schottky analysis used to determine the flat band potential and the donor concentrationt, the results indicated n-type conductivity for ZnS/ZnO heterostructure and ZnO, ZnS thin films. The optical band gap values are found 3.29 and 3.45 eV for ZnO and ZnS/ZnO heterostructure respectively. Scanning electron microscopy measurement point out the increase of grain size. Homogeneous and uniform surface was confirmed by atomic force microscopy. The obtained heterostructures would be usful for photovoltaic applications.

Développement d'une cellules solaire hétérojonction n-ZnO/p-Si.

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Abstract: La cellule solaire hétérojonction simple à base d'oxyde de zinc de type n-ZnO et de type p (p-Si) est l'une des nombreuses solutions pour remplacer la technologie conventionnelle de cellule solaire à simple homo-jonction Si. Pour déterminer les paramètres ayant une influence considérable sur les performances des cellules solaires ZnO/n-Si, nous avons réalisé des simulations à l'aide du logiciel PC1D. Nous avons démontré que les meilleures grandeurs pour l'épaisseur d'émetteur, l'épaisseur de base, la densité de dopant d'émetteur et les densités de dopant de base sont respectivement de 18.5 μm, 407.143 μm, 5.1016cm – 3 et 1. 1017cm – 3, afin d'obtenir 24.4% d'efficacité des cellules solaires standard.

FOPID Control Based on Evolutionary Algorithms for Quarter Car Nonlinear Active Suspension System

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Abstract: Abstract studies the active suspension system of a quarter-car model. Which is modeled mathematically as a two degree of freedom (DOF), a combination of components and mechanisms to ensure the comfort and safety of the driver and passengers in the car. The management and stability of the car depend to a large extent on the quality of the suspension generally, and this is why car manufacturers are turning to an adjustable suspension that can be adapted to slanted road surface (Ramp Road) as it controls the vertical movement for car wheels. In this study, we show how an active suspension can be changed to adapt on the move by controlling it with an ordinary Fractional-Order proportional integral differential (FOPID), and intelligent Fractional-order PID controllers tuned by evolution methods (genetic algorithms and PSO algorithms). the simulation results demonstrate the robustness and effectiveness of the proposed FOPID tuned by the PSO algorithm in controlling and adapting the active suspension.

Charpy Test of a Renewable Material (Bioplastic Starch).

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Abstract: Plastics are considered today the most widely used and versatile materials of the modern era [1]. Plastic materials derived from petrochemical raw materials used recently have severely impacted the environment by their pollution, and the occurrence of epidemics due to the massive use of petrochemical polymers, which has been accompanied by a shortage of oil, therefore, many studies have focused on the synthesis of renewable and biodegradable polymers [2]. Considerable efforts are also being made to replace petrochemicals with materials made from renewable ingredients, the use of Biodegradable bioplastic has attracted a lot of attention due to its environmentally friendly properties, wide variety, and availability, its non-toxicity, and its low cost [3]. Starch is considered one of the most promising natural polymers used in the production of biodegradable plastics, due to its biodegradability, enormous abundance, annual regeneration, and low cost [4]. Polyols and glycerin compounds are among the most widely used plasticizers [5]. In this study, starch/glycerin bioplastics are made with variable mass ratios, then the specimens were subjected to impact resistance by Charpy impact to see their resilience. The results show that the bioplastic starch/glycerin 40% Glycerin (SG40) had better properties compared to the rest of the bioplastic and the Charpy impact energy modulus was around 14.85 (Kj/m2), which is 1.3 times higher than that obtained from bioplastic SG30 (30% glycerin), and 1.2 times higher than that obtained from bioplastic SG50 (50% glycerin).

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Production of environmentally safe softeners of rubbers and gums

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Abstract: Plasticizers are widely used in the rubber industry, including the production of automobile tires. The volume of their consumption is at about 10-15% of the total volume of the production of rubbers. The most versatile plasticizers for rubber compounds are aromatic oil-softeners for the tire industry of type PN-6sh, obtained from a mixture of extracts by selective cleaning of oil fractions and from deasphaltsites, well mixed with styrene-butadiene rubbers [1]. However, this oil-softener may contain up to 20% by weight polycyclic hydrocarbons, some of which might be carcinogenic. Based on research results, held in Moscow, up to 60% of polluting and hazardous substances for health are emitted into the air by worn rubber tires [2]. In accordance with the directive of the EU Parliament, all softening oils, used in the EU countries, should contain no more than 2.9% by weight polycyclic aromatic hydrocarbons (PAHs) [3]. Environmentally safe oils are obtained by secondary treatment of aromatic extracts by solvents, which (solvents) dissolved selectively polycycloarenes. Up to the moment, the main solvents that are used are dimethylsulfoxide (DMSO) and the use of propylene carbonate for this purpose is also patented. However, both dimethylsulfoxide and propylene carbonate are characterized by low thermal stability, which complicates their regeneration [4, 5]. N-methylpyrrolidone (N-MP) is much more thermally stable; the temperature of the beginning of its decomposition (tensiometric method) is 320°C [6]. N-MP also has a high selectivity with respect to polycyclic arenes - monoaromatic hydrocarbon systems [7], which is especially important when cleaning the oil softeners from benzo(a)pyrene and other carcinogenic polycyclic hydrocarbons. However, because of the excessively high solubility, N-MP is mixed with aromatic oil-softeners. To form a heterogeneous system, mixtures of N-MP with ethylene glycol, are used for the extraction of benzene and its homologues from reforming catalysts (Arosolvan process). The purpose of this work is the choice of an effective and thermally stable extractant for the cleaning oil softeners from polycyclic hydrocarbons and resins, including carcinogeniccompounds .

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Formulation of a Self-compacting Eco-Concrete based on Recycled Tile Waste Aggregates

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Abstract: The reuse of construction waste as recycled materials in a self-compacting concrete (SCC) offers a good solution for the management of this waste, it allows to protect the environment, to save natural resources and allows to acquire a sustainable development [1, 2]. The SCC presents a homogeneity and a workability which facilitates its implementation without the use of the means of vibration from where the reduction in the cost of manufacture.

The objective of this study is a contribution to formulate an economical self-compacting concrete (eco-SCC) based on recycled raw materials such as tile waste gravel and glass powder. The incorporation of this waste was realised into two variants, the first of which comprises 50% of the waste tile gravel with 20% of glass powder, and the second comprises 100% of the waste tile gravel and 40% of glass powder. A comparison was presented between the characteristics, in the fresh state and in the hardened state, of the elaborated SCCs and those of the control SCC made from natural aggregates.

The results obtained show that it is possible to manufacture an eco-SCC based on recycled materials (gravel of tiling waste and glass powder), where it has been able to acquire characteristics very close to those of the control SCC, whether in the fresh state or in the hardened state in terms of mechanical behavior. So, we can say that we have been able to manufacture an eco-BAP which is stable and environmentally friendly.

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Study of The Structural, Morphological and Optical Properties of The Nano-structured TiO_2 Thin Films

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Abstract: Titanium dioxide (TiO_2) is one of the most studied transition metal oxides [1]. While, TiO_2 films has very intriguing optical and chemical properties including high refraction index and dielectric constant, low extinction coefficient in the infrared and the visible region, high resistance to photocorrosion and ecological non-toxicity [2-3]. In this work, TiO2 thin films were deposited onto glass substrate by two different techniques: sol– gel dip-coating (SG) and reactive DC magnetron sputtering (Sput). The prepared samples have been characterized by means of μ-Raman, scanning electron microscopy (SEM), UV-Visible spectrophotometry, and M-Lines spectroscopy (MLS). The μ-Raman results showed an amorphous TiO_2-SG phase and the vibrational mode of TiO_2-Sput is anatase phase. SEM spectroscopy has shown that TiO_2-SG has a disordered and more porous surface, TiO_2-Sput sample is homogeneous and shows uniform distribution of densely packed well-defined grains. The optical transmittance spectra varying from 60 to 88% in the visible region. The gap energy deduced from the transmittance are 3.48 and 3.53 eV for TiO_2-SG and TiO_2-Sput, respectively. The optical waveguiding measurements carried out on TiO2-SG and TiO_2-Sput films show single guided modes behavior (TE0 and TM0). These measurements have allowed deducing the refractive index and thickness values that are 2.06 at 216 nm for TiO_2-SG and 2.26 at 204 nm for TiO_2-Sput thin films. The analysis of waveguiding properties indicates that amorphous TiO_2 may prove to be more efficient in photonic device as compared to crystalline TiO_2.

Pattern Recognition and Diagnosis of Multiple Open Circuit Faults in the Inverter Feed of an Induction Motor Drive Using Neural Networks

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Abstract: The operation and control of induction motors and inverter drives under faulty conditions is a very challenging task in the present day. For that reason, these electrical systems must be well considered to provide a relevant diagnosis of these elements. Consequently, etecting defects early will be very important in order to find methods to allow us to control the operation and take protective action to avoid regular failures. In particular, the work aims to examine the possibility of both a single and multiple fault switch detection, location, and diagnosis in a threephase voltage source inverter feeding an induction motor drive, using artificial intelligence (AI) technique with neural network direct torque control (Neural DTC). A proposed method based on a pattern recognition technique for open circuit switching faults in inverters is equipped with a simple feature extractor to make detection and diagnosis of faults possible and straight forward using a neural network technique. A classification performance for multiple faults is improved by the use of a neural network technique

Improving the productivity of a single slope solar still

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Abstract: Solar energy has multiple uses, as it is used to produce electricity. It is also used to obtain distilled water using solar distillers. The mechanism of the solar still is very simple. The solar still is a distillation basin that works as an absorbent solar panel that raises the temperature of the water inside it and after a while it evaporates leaving behind pollutants and dissolved solid minerals that do not have the ability to evaporate. Thanks to the temperature difference between the aquarium water and the glass covered by the wading, the evaporated water that is collected condenses. In order to exploit solar energy, we designed a single mile solar still for distilling saline water near the surface for use in the agricultural drip irrigation process. We also worked in our determination to raise the productivity of the solar still

Study of optical emission spectra during layer deposition silicon wafers with the MDECR technique

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Abstract: The study of equilibrium degrees of discharge plasma is important to understand the plasma kinetics which reflects on the characteristics and properties of the deposited thin films. The technique used is the "Matrix Distributed Electron Cyclotron Resonance" (MDECR: 20 sccmAr, 1μ bar, 1kW), the analysis of the optical emission spectroscopyin the 300nm-1100nm range shows the existence of some species in excited states such as Ar (3p54p: 2pi, i=10.1), H (n=3(1s3) →n=2 (1s2) and n=4(1s4) →n=2(1s2)). There are several models used in the study of plasmas and to determine these characteristics such as the electron density, the electron temperature, the densities of different species in the plasma. We use in this study the partial local thermodynamic equilibrium model. The value of Texc calculated from the light intensity of the IHα and IHβ lines, using the intensity ratio method, is equal to
2.65 eV Using the Boltzmann diagram method, the excitation temperature for the sub group (Jc= 1/2) is Texc=1262.83165 K = 0.11 eV and the subgroup excitation temperature (Jc= 3 /2) is Texc=5645.8512 K = 0.49 eV.

Keywords: excitation temperature, optical emission spectroscopy, partial local thermodynamic equilibrium.

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