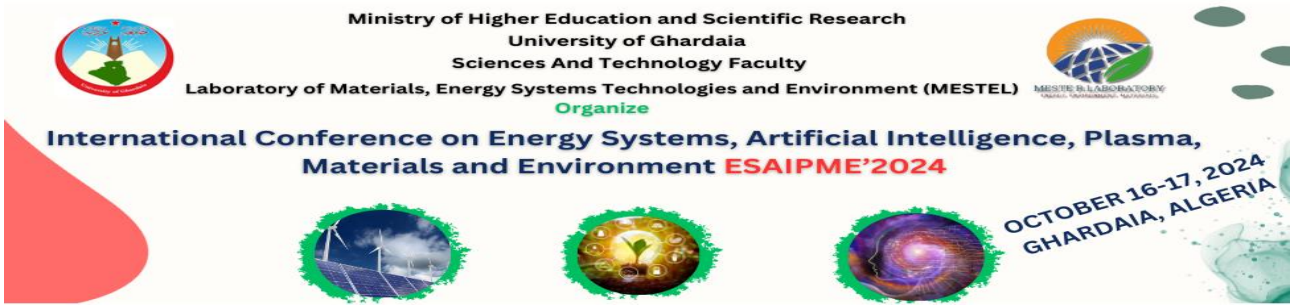

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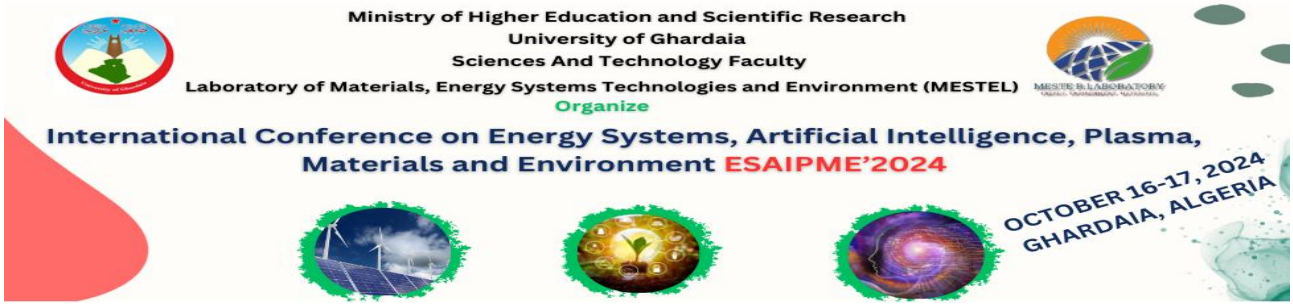

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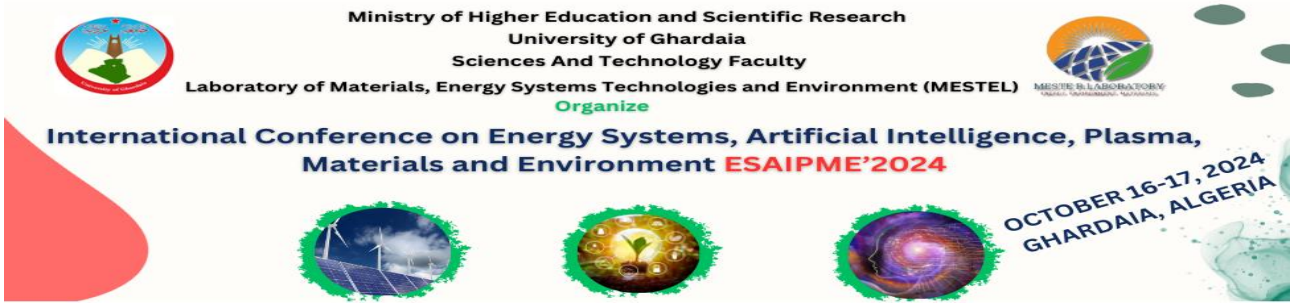

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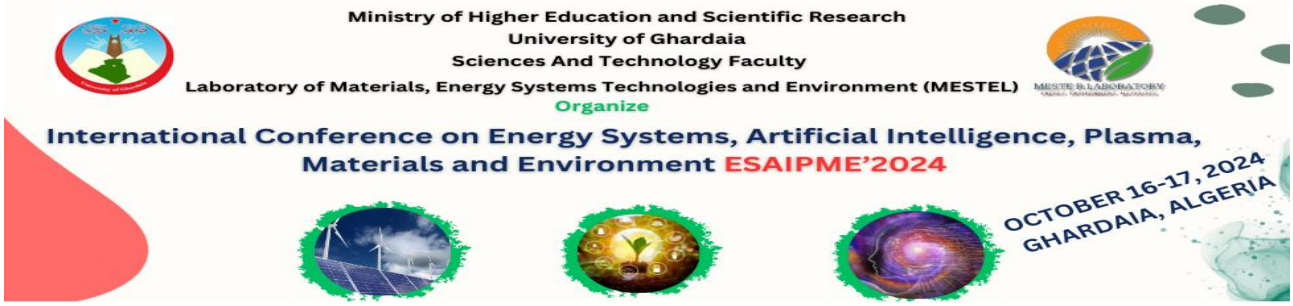

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A DFT study of perovskite type halides KXCl3(X =Be, Ca): structural, electronic and mechanical properties.

Sonia Chebouki*[1], Ouarda Nemiri[1], Faycal Oumelaz[1], Djamel Boudjaadar[2]
Wissem Gouasmia[1], Nesrine Louati[1]
[1] Laboratory of Physical Chemistry and Biology of Materials (LPCBM), Department of physics, Higher Normal School of Technological Education of Skikda, Algeria.
[2] Department of physics, LRPCSI-University of august 20th 1955 Skikda, Algeria
*[1]chebouki.sonia@enset-skikda.dz

Abstract. Ab-initio analyzed of structural, electronic and mechanical characteristics of chloroperovskites compounds KXCl3 (X= Be and Ca) employing Density Functional Theory within the WIEN2K code framework. Based on full poten-tial linearized augmented plane wave (FP-LAPW) method. The optimization was performed employing generalized gradient approximation developed by Wu-Cohen (WC-GGA), while the mBJ approach is applied to compute the electronic properties of our materials. The results indicate that the studied compounds exhibit semiconductor behavior with wide indirect band gaps. The estimation of elastic properties demonstrate that KBeCl3 and KCaCl3 are identified as ductile materials suitable to apply in various me-chanical applications. To explore novel potential applications in renewable energy and advanced optoelectronic. This research into the computational of varied properties for materials presents an advanced strategy for theorists and experimentalists.

Keywords: KXCl3 (X = Be and Ca), DFT, halide Perovskite, WIEN2K code.

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Structural and electronic propertiesof hydrogenstorage in NaH and Na7CH8 hydrides

Hana Khenfer[1], lazhar mohammedi[1], lazhar benmabrouk

[1]Univ Ouargla, Fac. des Mathématiques et des Sciences de la Matière, Lab. Développement des énergies nouvelles et renouvelables dans les zones arides et sahariennes, Ouargla 30 000, Algeria
E mail :khenferhannaa@gmail.com

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), implemented in WIEN2k code. Calculations are carried out to analyze the improvement of hydrogen storage properties in Na-base hydrides through a double substitution NaH and Na7XH8 (X: C). in this work we stady the structural and electronic properties of the Na_7CH_8 hydride compared to the structural and electronic properties of the NaH hydride. Where we calculated each of Optimized structure parameters, hydrogen gravimetry, and formation energy and desorption temperature of NaH and Na7CH8. We have the Na_7CH_8 hydride has

the smallest lattice parameters and desorption temperature and high gravimetric hydrogen compared the NaH hydride. NaH has an insulating character while the Na_7CH_8 hydride has a conducting one. A strong covalent bond was found along (Na-C) and along (H-C) whichthe formation energy shows that there is a gradual decreasing in the stability of the hydride sodium, this hydride which favourite easily the hydrogen storage and the hydrogen restitution compared to the reference sodium hydride NaH. Such a study has been done before on the doubly substituted Li based hydrideLi7CH8 and its comparison with lithium hydride LiH which in turn gave good results in hydrogen reversibility.

Keywords: sodium hydrides, electronic properties, WIN2K, DFT, hydrogen storage.

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Structural, electronic, thermal and elastic Properties of CsPbCl3 Perovskite: a density functional study.

Wissem Gouasmia[1], Djamel Boudjaadar[2], Faycel Oumlaz[1], Ouarda Nemiri [1], Chebouki Sonia[1], Nesrine Louati[1]

[1] Chemistry, physics and biology of materials laboratory Department of physics, Higher Normal School of Technological Education of Skikda, Algeria
[2]Department of physics ,LRPCSI-University of august 20th 1955 skikda, Algeria

wissem.gouasmia@enset-skikda.dz

Abstract. This study investigates the structural, electronic, and optoelectronic properties of cubic perovskites **CsPbCl3** using the full potential linearized augmented plane wave (FP-LAPW) method. Theoretical calculations of lattice constants to be a=5.63 A which align well with experimental data. The band gap was found to be a direct one at Eg=4.3ev confirming these materials as wide and direct bandgap semiconductors. Thermal properties including heat capacity Cv, Debye's temperatue, and entropy were computed and discussed too .Also, we calculated elastic properties using Irelast code, the computed values show that our compound is mechanically stable . This study provides a comprehensive theoretical foundation for understanding the structural , thermal and mechanical behavior of these perovskites, paving the way for their technological exploitation

Keywords: Cubic Perovskites ; $CsPbCl_3$; FP ; LAPW Method ; Lattice Constants ; Bandgap Semiconductors ; Ionic Bonding ; Covalent Bonding ; elastic Properties.References

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The distribution function of the electric micro field of magnetized plasma

HouriaGuerrida[1], KeltoumChenini[2],*, Mohammed TayebMeftah[2],**

[1] Laboratoire de Recherche plasmas et physique des surfaces(LRPPS)
[2]MESTEL Laboratory/ Faculty of Sciences and Technology, Université de Ghardaia
* Département d'automatique et électromécanique/Faculté des Sciences et de la technologie, Université de Ghardaia
** Département de Physique, Faculté de Mathématique et Sciences de la Matière, Université de Ouargla
guerridahouria47@gmail.com

Abstract. The spectral lines shapes are a means suited for the diagnosis of hot anddense plasmas. The analysis of the physical properties of an atomic system within plasma suggests the introduction of the theory of disturbances 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 in the system. Often all the effects of plasma disrupting ions on an atom can be treated as a uniform electric micro field produced by all plasma ions

In the present work, we focus our attention to calculate the distribution function of the electric micro field of magnetized plasma

Keywords: Plasma, magnetic field, charged particles, distribution, micro field.

Energy In The Hands Of Storage

Mounira Bouabdallah[1 2]

[1] Facultyof Sciences and technology ,Mohamed El Bachir El Ibrahimi University of Bordj Bou Arréridj
[2] Laboratory of Treatment and Formation of Fibrous Polymers, Faculty of Technology, M'hamed Bougara University of Boumerdes,Algeria
mounira.bouabdellah@univ-bba.dz

Abstract. Hydrogen produced by thermal cracking or electrolysis of water, or by reforming natural gas (methane). By 2050, this energy carrier will be able to supply electricity in fuel cells used to power cars, or in power generation plants. The efficiency of a fuel cell engine is twice that of a gasoline engine. But the difficulties lie in producing, transporting and storing the hydrogen before use. A study carried out by ADEME shows that to generate 100 kWh of electricity from hydrogen, 440 kWh of electricity are needed, as hydrogen storage involves 80% losses in the storage process.

It has a high energy content (120 MJ/kg) compared with oil (45 MJ/kg) and natural gas (50 MJ/kg). However, it is also the lightest and least dense gas (0.083 g/l at 20°C and 1bar), resulting in a low volumetric power (10.8 MJ/m^3). Hence the need to compress the hydrogen supply to a considerable pressure (in the region of 1,000 bar, i.e. four times that used in industry) in order to transport such a tank on a vehicle. The energy required to compress hydrogen to 700 bars is 22MJ/kg.
The manufacture of a tank capable of handling such a high pressure requires robust, durable materials and stringent quality control. A 2 MW hydrogen storage system could contain 120 t of steel, 2.25 t of Cu and 0.6 t of Al. Magnesium, which is seen as a promising component for H_2 storage in the form of MgH_2 hydrides. A tank with a range of 500 km would contain 70 kg of Mg. Around 4 million tonnes of Mg would be needed to equip 10% of today's vehicle fleet. However, the production, transport and storage of hydrogen pose problems of profitability and safety.
Keywords: hydrogen , storage , hydrogen tank , liquid hydrogen , production.

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Third-Order Sliding Mode Applied to Dc-Bus voltage regulator for PV application

Amine Mehdi FIHAKHIR and Abdesselam GUERBOUZ

[1] Faculty of Science and Technology University of Ghardaia, Algeria
[2] LAADI Laboratory, Faculty of Science and Technology, Djelfa University, Algeria.

fihakhir.amine-mehdi@univ-ghardaia.dz
Abdesselam.guerbouz@univ-djelfa.dz

Abstract. This paper presents a Third-Order Sliding Mode (TOSM) control strategy to enhance the stability and robustness of the DC-link voltage in a photovoltaic (PV) grid-connected system. The proposed control method demonstrates superior tracking performance by regulating the DC-link bus voltage with a fast transient response and minimizing oscillations. Additionally, it effectively reduces Total Harmonic Distortion (THD) in the current injected into the grid, regardless of varying weather conditions. Comprehensive comparisons between the proposed TOSM controller and traditional control techniques, such as the conventional Proportional–Integral (PI) controller, are conducted using MATLAB/SIMULINK. These comparisons highlight the advantages of the TOSM approach in improving voltage regulation and overall system performance. The results confirm that the TOSM control strategy offers a more robust and efficient solution for managing the dynamic behavior of PV grid-connected systems compared to conventional methods.
.**Keywords:** PV, Dc-Link regulator, Third-Order Sliding Mode, THD.

The Flare gas recovery systems

Bitour Yousra [1] , Korichi Morad [1] , Bacha Oussama [1],

1 Laboratory of Dynamic Interactions and Reactivity of Systems, Kasdi Merbah University, Ouargla 30000, Algeria

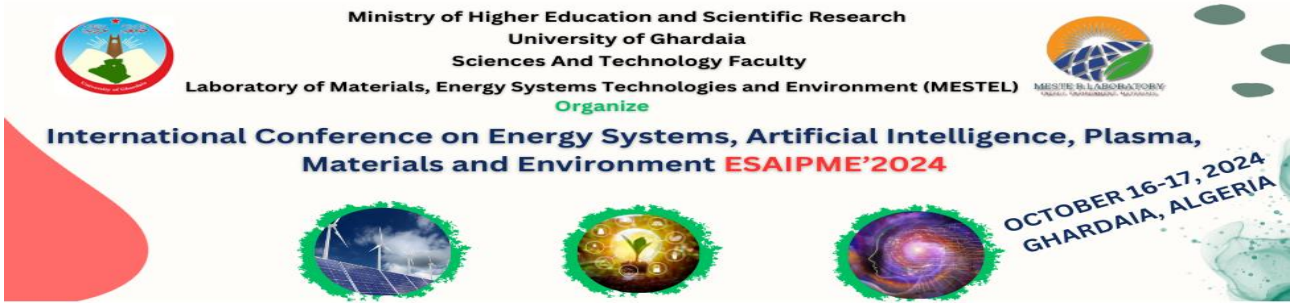
Bitour.yousra@univ-ouargla.dz , Mourad.korichi@gmail.com ,

bacha.oussama@gmail.com

Abstract. Gas flaring is a widely used procedure in many chemical systems, especially in refineries, petrochemical businesses, and oil facilities, for pressure adjustment and safety management. This process has broad ramifications: it influences human health locally, the environment regionally, and it contributes to climate change internationally. In actuality, one of the main causes of greenhouse gas emissions is gas flaring. Methane (CH4) and carbon dioxide (CO2) make up the majority of fugitive emissions from fuels in Algeria, according to data on greenhouse gas emissions. The production, processing, and transportation of natural gas are the primary causes of these emissions, as are venting and flaring operations. Algeria's greenhouse gas emissions were predicted to have reached 206 Mt CO2 equivalent by 2020 (1). In addition to causing environmental harm, flaring wastes a precious energy source that could be used to promote economic expansion. The majority of flared gases have a lot of fuel potential. Realizing this, the relationship between energy conversion and waste reduction has drawn interest as a viable strategy for protecting the environment and achieving carbon neutrality. This study looks at different approaches used today to recover gas emissions and turn them into value-added products and renewable energy (2).

Keywords: Gas to electricity, CO2 emissions reduction, Gas flare reduction, energy recovery

Exact Solution of Time-Independent One-Dimensional Klein-Gordon Equation By SUSY QM Approach In The Presence Of Scalar Potentials And Vector Potentials.



Samia. Medjenah [1] and Farid. Benamira [2]

Laboratoire de Physique Théorique, Département de Physique, Faculté Des Sciences Exactes, Université Frères Mentouri Constantine 1

samiam1984@hotmail.fr
benamira@umc.edu.dz

Abstract. In this work, we present a method to solve the one-dimensional time- independent Klein-Gordon equation for a scalar particle, subject to the potentials, scalar)(xS and vector)(xV , using the approach of supersymmetric quantum mechanics (SUSY QM) [1- 3] and shape invariance. The Klein-Gordon equation is solved exactly, for bound states, by reducing it to a position-dependent Schrödinger-like equation with an energy-dependent effective potential.

Keywords: Supersymmetry in quantum mechanics; Shape invariance; PT-symmetry; Klein- Gordon equation; Position-dependent mass; Bound states

Techno-Economic Evaluation of Green Hydrogen Production from Solar Energy in Southern Algeria

El Mouatez Billah Messini [1,2,3] [0000-0001-7604-4905], Yacine Bourek [4] [0009-0003-7714-6614], Chouaib Ammari [5] [0000-0002-0890-5168] and Charaf Abdelkarim Mosbah [6] [0009-0003-8837-2860]

1 LAGE Laboratory, Faculty of Applied Sciences, Electrical Engineering Department, University of Ouargla, 30000 Ouargla, Algeria

2 School of Production Engineering and Management, Technical University of Crete, 73100 Chania, Greece

3 Sonatrach - Institut Algérien du Pétrole - École de Hassi Messaoud - BP 54 – Hassi Messaoud, 30001, Ouargla, Algeria

4 Electrical Engineering Department, Faculty of Applied Sciences, Ouargla University, Road Ghardaia, 30000 Ouargla, Algeria

5 Department of Renewable Energy, Faculty of Hydrocarbons, Renewable Energy, Science, Earth and Universe, University Kasdi Merbah-Ouargla, Algeria

6 Laboratory of Materials, Energy Systems Technology and Environment, Faculté des Science et Technologie, Département d'automatique et électromécanique Université de Ghardaia, Ghardaia, Algeria

messini.elmouatezbillah@univ-ouargla.dz ; emessini@tuc.gr

Abstract. The generation of green hydrogen by the use of renewable energy sources, such as solar power, is proving to be an increasingly viable alternative for lowering emissions of greenhouse gases. In this research, a techno-economic study is carried out to quantitatively evaluate and analyse the hourly generation of hydrogen from a single photovoltaic (PV) panel. The importance of this study cannot be overstated, as it provides crucial insights into the potential of green hydrogen production. To achieve the research aims, the study location was chosen to be many provinces in south Algeria, a region with significant potential for renewable energy sources. Technical feasibility and economic evaluation are considered in this study, including the sizing and performance analysis of the PV panel, the expense of the equipment, and the cost of producing hydrogen. According to the findings of the research, a single PV panel of 420Wc can produce, in most provinces, a cumulative amount of hydrogen between 105 and 140 m3/year. The cost of green H2 production stays between 3.2 and 3.5 $/kg of produced H2 and looks to be competitive. With these promising results, it's clear that researchers, policymakers, and industry professionals play a crucial role in the future of green hydrogen production. Algeria can minimise its emissions of greenhouse gases and promote the creation of a hydrogen economy that is environmentally responsible.

Keywords: Green Hydrogen; Solar Energy; Photovoltaic Panel; Techno- Economic Analysis; Renewable Energy; Hydrogen Economy

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Precise Calculation of Effective Direct Normal Irradiance (DNI) and Optimization of Concentrated Solar Power Performance in Algeria (Ouargla and El oued regions)

Larbi Mohamed [1], Rouibah Abdelkader [2], Kouider Laroussi [3], LAISSAOUI Mohammed[4] ,Kamal Mohammedi[5]

[1] Laboratory Applied Automation and Industrial Diagnostics of University of Djelfa (LAADI), PO Box 3117, Djelfa 17000, Algéria; E-mail: Mouhamed.larbi@univ-djelfa.dz

[4]Doctor Of Engineering,Solar CSP Team Leader İn CDER ALGERIA,(Mohamed Laissaoui4416@Gmail.Com

[5]University of M'hamed Bougara, UMBB, Boumerdes, Algeria; , E-mail:

mohammedi.kamal@univ-boumerdes.dz / a.rouibah@univ-djelfa.dz /

k.laroussi@univ-djelfa.dz

Abstract – This study examines the shortcomings of previous research in the calculation of Direct Normal Irradiance (DNI), which predominantly depended on real or hybrid datasets but frequently lacked the necessary accuracy to identify effective and optimal values. We introduce an innovative hypothesis designed to improve the precision of DNI calculations through the use of satellite data. Our methodology aims to enhance the estimation of effective and accurate direct normal radiation, thereby increasing the reliability of solar energy evaluations. By harnessing satellite data, we intend to address existing gaps in current methodologies and establish a more comprehensive framework for analyzing and optimizing solar energy potential. Additionally, the performance of Concentrated Solar Power (CSP) plants is assessed, and Csp systems are modeled Utilizing the SAM application. we focused on the Ouargla and El Oued regions of Algeria.

Keywords *– Solar İrradiance ; Meteorological Data; Direct Normal İrradiance (DNI) ; CSP Plant Performance Evaluation.*

The effect of solar tracking devices on the performance of the photovoltaic unit in the Sidi Khouiled Ouargla region

Zineb Korichi [1] , Abdelkader Souigat [1] , Rachedi Mohammed Yacine [2] , Abdelmadjid Kaddour [3] , Driss Slimani [1]

1 Ecole Normale Supérieure de Ouargla, Algeria

2 Dept. of Electronics and Telecom, University of Kasdi Merbah Ouargla

3 Unité de Recherche Appliquée en Energies Renouvelables, URAER, Centre de Développement des Energies Renouvelables, CDER, 47133, Ghardaïa, Algeria

zinebkorichid02@gmail.com

Abstract. Photovoltaic modules, constructed from semiconductors, enable the direct conversion of sunlight into electricity. These panels offer a secure, dependable, low-maintenance, and environmentally friendly energy source for an extended duration. Most modules available today offer warranties exceeding 20 years, with performance capabilities extending far beyond that duration. This paper delves into an experimental examination of various solar trackers and their effects on the performance of a photovoltaic module, conducted in the SidiKhouiled region of Southeast Algeria. The findings indicated that the slight temperature variance between the one-axis and two-axis trackers hints at a possible inclination towards the

economically viable monopolar alternative. Significantly, the graphs depicting the performance of one-axis and two-axis trackers closely resemble each other, indicating the possibility of favoring the cost-efficient monopolar tracker over the pricier bipolar tracker. This choice stems from an economic evaluation conducted through SAM software, specifically assessing the Levelized Cost of Energy.

Keywords: Energy, Solar panels, Photovoltaic, Economic assessment, LCOE, Solar tracking.

Magnetic properties of Fe56Pd44-xGdx thin films

Mohamed Abdennour Sahari[1] , Elena Sonia Olivetti[2] , Alessandro Magni[2] , Gianluca Fiore[3] , Mokhtar Boudissa4 , Paola Tiberto[2] , Saida Bahamida[5] , Marco Coïsson[2]

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1 Research laboratory: IRME- Department of Physics, University of Boumerdes, Boumerdes, Algeria.
2 INRIM, Advanced Materials and Life Sciences Division, strada delle Cacce 91, 10135 Torino (TO), Italy.
3 Dipartimento di Chimica e Centro Interdipartimentale NIS (Nanostructured Surfaces and Interfaces), Università di Torino, Via Pietro Giuria 7, 10125, Torino, Italy.
4 ENMC Laboratory, Department of Physics, Faculty of Sciences, University Ferhat Abbas, Setif 19000, Algeria.
5 Research unit UR-MPE, University of Boumerdes, 1 Avenue de l'Independance, Boumerdes 35000, Algeria.

m.sahari@uni-boumerdes.dz

Abstract. The addition of rare earth elements (REE) to binary alloys has become attractive for many different reasons [1], such as tailoring their magnetic properties to match the needs of many different applications: permanent magnets, magnetostrictive detectors, magnetocaloric materials, magnetoresistance, etc. [2,3]. In contrast to Nd, Tb, Pr, and Dy, which are less abundant in natural resources and more susceptible to oxidation than light rare earth elements, Gd has recently been deemed more appropriate. Moreover, since Gd is much cheaper than Nd, Tb, Pr and Dy, it may become viable to reduce the cost of magnets by replacing these elements [4]. In addition, for some alloys, such as Fe-Pd, even if there is not a rare earth, the replacement of Pd, a precious metal, with less costly materials may be desirable. It would be interesting to check whether the substitution of some of it by Gadolinium could lead to different properties than the conventional ferromagnetic Fe-Pd system [5,6,7,8,9], By developing a ternary Fe-Pd-Gd compound, it is therefore hoped that a more complex and varied microstructure can develop, affecting the magnetic properties of the Fe-Pd system. It has to be pointed out that even though many reports indicate an improvement of the hard magnetic properties of ferromagnetic materials when REE are added, their weakening is also possible [10], [11], [12], [13], for example through antiferromagnetic couplings between Fe 3d and Gd 4f magnetic moments that can also lead to a decrease of saturation magnetization (Ms). Since the investigation of Fe-Pd-Gd alloys is nowadays almost unexplored, in this paper we have studied the effect of partial Pd replacement by Gd in Fe-Pd thin films evaporated onto Si(100)/SiO2 substrate to understand how the micro-structure of this ternary system compares with that of the known Fe-Pd alloy, and consequently how the magnetic properties are affected. An in-depth investi- gation of the structural and magnetic properties has therefore been performed of both as-prepared and thermally annealed samples, with the aim of helping clarifying the magnetic properties of the so far almost unexplored Fe-Pd-Gd ternary system.

Keywords: Magnetic hysteresis Ferromagnetic materials Phase transitions Magnetic force microscopy.

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CFD Performance of *k*-ω SST Model in Predicting Swirling Annular Flow

Redjem Hadef[1], Djemoui Lalmi[2], Abderrahmane Bellaouar[3] and Lyes Bordja[4]

[1,4] University Oum El Bouaghi, Algeria
[2,3] Laboratory of Materials, Energy Systems Technology and Environment, Faculté des Science et Technologie, Uiversité de Ghardaia, Algeria
eldjemoui@gmail.com

Abstract. The paper investigates an annular swirling flow, around a cylindrical center body issuing into a sudden expansion. Although computationally more expensive approaches, the Reynolds Stress Model and Large Eddy Simulation have demonstrated a high capability of dealing with such flows, these techniques are often unsuited for use in complex design studies where computational speed and robustness are key factors. In the present approach, the Shear Stress Transport turbulence model is employed for the three-dimensional numerical simulations and the calculated results were validated using experimental data. They show that the selected model is competitive in terms of accuracy when compared to measurements. The flow structure was found to be composed of a forced-free vortex. The effect of the presence of the bluff-body on the flow is limited to a short region upstream of it; so that the effect on the flow structure and strength of swirl upstream can be considered negligible.

Keywords: Fluid Mechanics, Turbulence, Swirl, CFD

Modelling of dynamic stall in a rotor of a wind turbine with vertical axis darrieus type h using comsol multiphysics.

Ayachi Amar Abdelouahed*[1], Belkheir Noura[1] , Ali Ayachi Omar*[2] , and Chaima Ayachi Amar[3]

[1]Universit´e Hassiba Benbouali of Chlef – Algeria
[2]Process Engineering Laboratory (PEL), Kasdi Merbah University, Ouargla, Algeria 30000 – Algeria
[3]Kasdi Merbah University, Ouargla, Algeria 30000 – Algeria

Abstract
The impact of dynamic stall on the aerodynamic performance of a Darrieus H three-bladed vertical axis wind turbine is thoroughly numerically analyzed. This is accomplished by using a sequence of simulations that are based on the Reynolds averaged Navier-Stokes (RANS) model and incorporate SST model turbulence modeling. It is crucial to design wind turbines that function within the bounds of dynamic stall because the data collected demonstrate that when the profile stalls, the performance of the blades drops.

Keywords: Wind turbine, rotor H, CFD, RANS, SST model

Numerical analysis of MoS_2 based solar cell using non-toxic $In_2S_3/SnS_2/ZnSe$ Electron transport layer

Abdelbasset Rahmoune[1]

[1] Université Kasdi Merbah Ouargla – Algeria

rahmoune.abdelbasset@univ-ouargla.dz

Ministry of Higher Education and Scientific Research
University of Ghardaia
Sciences And Technology Faculty
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Abstract. In this study, Molybdenum disulfide (MoS_2) based thin film solar cells (TFSCs) of the structure $Al/Gr/ETL/MoS_2/Sb_2S_3/Ni$ have been simulated using SCAPS-1D software. Due to their remarkable properties, three Cd-free and non-toxic (In_2S_3, SnS_2, and ZnSe) electron transport layer (ETL) materials have been suggested for MoS_2-based TFSCs. The effect of different layer parameters on the performance of the cells has been investigated for various ETL materials. The considered parameters are the MoS_2 absorber layer thickness the carrier density and thickness of the ETL, and the ETL/MoS_2 interface defect density. The simulation results show that the highest power conversion efficiency is achieved for the MoS_2 absorber layer thickness of 1.0µm, and the thickness and carrier density of different ETLs of 0.05 µm and $10^{16}cm^{-3}$, respectively. We found that the defect density of the ETL/MoS_2 interface should be $10^{12}cm^{-2}$ at most. The optimized power conversion efficiencies of MoS_2-basedw TFSCS are found by simulation 27.87%, 28.22%, and 28.28% for the cell with In_2S_3, SnS_2, and ZnSe ETL, respectively. Among the three used ETL materials, zinc selenide (ZnSe) shows the best results due to its wider band gap. The results of simulations reveal that high-efficiency MoS_2 solar cells with non-toxic (In_2S_3, SnS_2, and ZnSe) ETLs can be obtained. Overall, the numerical simulation conducted in this study could contribute to the manufacture of Cd-free non-toxic and highly efficient MoS_2-based solar cells.

Keywords: MoS_2 solar cell, In_2S_3, SnS_2, ZnSe, Graphene, Numerical Simulation.

A numerical simulation and analysis of perovskite solar cells utilizing different electron transport materials

Amani Sabrine Lakhdari [1], Ibn Khaldoun Lefkaier [1] , Ahmed Draoui [1,2] , Zoulikha Hebboul [2]

[1].Laboratory of Materials Physics, Amar Telidji University of Laghouat, BP 37G, 03000 Laghouat, Algeria – Algeria
[2]. Laboratory of Physico-Chemistry of Materials (LPCM), Amar Telidji University of Laghouat, BP 37G , Algeria

as.lakhdari@lagh-univ.dz

Abstract: Perovskite materials play an important role in the development of photovoltaic technologies due to their unique structure, which allows them to effectively ab-sorb light and convert it into electricity with high efficiency. In this study, we chose the solar cell based on the perovskite structure. This was calculated using the SCAPS-1D Simulation program. First, we determined the structure of the device consisting of FTO/ETL/MASnI3/ MoO3. We chose MASnI3 as an ab-sorbent material , (HTL:MoO3) is a material that conducts holes. We also chose several layers that conduct electrons (ETL: Tio2,C60,WS2,ZnO,PCBM) with the aim of determining which one gives us better efficiency. Then we moved on to study the effect of thickness and temperature on the solar cell.

Key words: SCAPS, 1D, HTL, ETL, perovskite, solar cell.

Performance of CIGS solar cell with non-toxic buffer layer

Bechlaghem Sara[1] , Zebentout baya[1] , Benamara Zineb[1]

[1] Applied Microelectronic Laboratory, Faculty of Electrical Engineering, Djillali Liabes University of Sidi Bel Abbes, 22000, Algeria

Abstract. Conversion efficiencies exceeding 19 % for thin-film solar cells based on CIGS cells with CdS buffer layers prepared by the chemical bath deposition CBD method have been reported by several groups over the past few years [1]. However, the toxicity of cadmium forces the research community to replace CdS buffer layer by other alternative, while preserving already achieved perfor-
mance. In different laboratories, the films based on ZnOS , ZnSe , (Zn,Mg)O, In(OH), were deposited on differently processed absorbers and tested as an lter-native to the traditional CdS buffer. The ZnOS and ZnSe buffer layers are one of the most

favorable candidates for replacing the CdS because both ZnOS and ZnSe possess large optical gaps.The simulation tool used for this study is Atlas of Silvaco-package based on the digital resolution 2D transport equations governing the conduction mechanisms in semiconductor devices as described in Section "Atlas numerical model description". The J-V characteristics are simulated under standard AM1.5G Illumination.

Keywords: CIGS, CDS, Solar cells, non_cadmium, Znos.

Comparative Analysis of Photovoltaic Performance: Laboratory-Synthesized versus Commercial oxide in Dye-Sensitized Solar Cells

Ahmed Draoui [1,2] , Mohammed Elhabib Naidjate[3] , Saad Boudabia[4] , Zoulikha Hebboul [5] , Ibn Khaldoun Lefkaier [1]

[1] Laboratoire de Physique des Matériaux (LPM), Université Amar Telidji de Laghouat, BP 37G, Laghouat 03000, Algeria.
[2] Départements de physique école normale supérieure de Laghouat.
[3] Laboratory of Semiconductors and Functional Materials (LSFM) Université Amar Telidji de Laghouat, BP 37G, 03000, Algeria.
[4] Laboratoire de Mathématique et sciences appliquées, LMSA Université de Ghardaïa, Algeria.
[5] Laboratoire Physico-Chimie des Matériaux (LPCM), Université Amar Telidji de Laghouat, BP 37G,03000, Algeria.

* a.draoui@ens-lagh.dz

Abstract: Using the solid-state method, we synthesized Zn2TiO4 nano particle, with XRD results indicating its presence in the final compound at 55% and an average particle size of 57 nanometres. The experimental gap energy values were determined to be 2.93 eV. A comparison of cell performance between purchased ZnTiO3 nano powder and laboratory-prepared material showed the latter outperforming, achieving an efficiency of 0.012%. The subpar outcomes underscore the crucial need for proper sealing in DSSCs to confine the electrolyte and ensure longterm operational stability. Elevated series resistance values impact the power curve shape without altering Voc and Jsc values, resulting in reduced yield. Furthermore, low shunt resistance values (Rsh = 0.17092 and 1.04 ohms for theprepared and purchased products, respectively) diminish solar cell efficiency by promoting increased recombination processes.

Keywords: Zn2TiO4, solid-state method, series resistance, DSSC, nano particle.

Heusler Alloys: The Next Generation of Thermoelectric Materials for Efficient Energy Conversion

A.Messaoudi [a] ,M. Matougui [a] , B. Bouadjemi [a], , A.Khatar a ,H.Bentahar [a] ,T. Lantri [a] , M. Houari [a] , O.Belarbi [a] , S. Bentata [a] , A.Zitouni [a]

a Laboratory of Technology and of Solids Properties, Abdelhamid Ibn Badis University, Mostaganem 27000, Algeria

abdelkarim.messaoudi.etu@univ-mosta.dz

Abstract. Thermoelectric materials are gaining attention because they can directly convert heat into electricity and vice versa, offering a potential solution to energy and environmental issues. Researchers are constantly looking for better materials, measured
by a figure of merit called ZT. This study focuses on Ba2AuSb alloy, which shows promising semi-conductor behavior. Using advanced calculations, the authors predict that this alloy has excellent thermoelectric properties, including a high Seebeck coefficient, good electrical conductivity and a ZT figure of merit close to 1. These results suggest that Ba2AuSb alloy could be highly effective thermoelectric material with broad applications. Using advanced simulations, we explored the characteristics of Ba2AuSb alloy. This
alloy belongs to a class of materials called "full-Heusler compounds." Our analysis revealed that this alloy like a semiconductor with indirect band gap of 1.11 eV. Interestingly, this compound shows excellent potential for converting heat

into electricity, boasting a high voltage response to heat (Seebeck coefficient), good electrical conductivity, and a highly desirable efficiency score (figure of merit close to1). These combined properties make Ba2AuSb alloy very promising candidate for
developing efficient thermoelectric materials.

Keywords: Full Heusler, band structure Seebeck coefficient, figure of merit, indirect band gap.

Modeling the Annual Solar Energy Availabile on Inclined Flate Plate Collector in Ghardaia and Optimizing the Slope Angle

B.ZITANI[1,] and D.LALMI[,2] and A.TRABELSI[1]

[1]Process Engineering Department, *Faculté des Science et Technologie, Université de Ghardaia, Algeria*
[2]*Laboratory of Materials, Energy Systems Technology and Environment, Faculté des Science et Technologie, Université de Ghardaia, Algeria*

zitani_brahim@yahoo.fr

Abstract. The flat plate solar energy collector with water flow is very basic and simple device to capture the available solar energy with minimum investment, especially when the collector is fix position and fix slope over the whole year, in this case a study like this study must be done to determine the amount of energy that can be collected with each specific slope angle for a given collector type in this area for that so we can decide on the common slope angle and direction for all the devices that will be spotted in this area to maximize the solar energy recovered along the year.

For this purpose, we have simulated and analysed and developed in FORTRAN code. A The code takes into account solar angles, glass and absorber optical properties, convection and radiation heat transfer between tube surface, glass cover, side walls, and insulating base of the collector as well as the convective heat transfer in the circulating water inside the tube and conduction between the absorber plate and tube material by considering natural circulating flow.

Experimental field tests were performed to validate the numerical model by comparing the outlet water temperature, modeling and experimental results shows good matching.

Keywords: Solar, Flat, Collector, buildings, Slope.

Developing an Optimal Matrix Treatment Strategy for the Haoud Berkaoui Oil Fields

Bazzine Zineb[1] and Chikh Sabrina[2]

[1] Kasdi Merbah University of Ouargla Algeria

zineb.bazzine@univ-ouargla.dz
chikhsabrina@yahoo.fr

Ministry of Higher Education and Scientific Research
University of Ghardaia
Sciences And Technology Faculty
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Abstract. Reservoir treatment is a critical activity in the oil industry. The primary objective of matrix treatment is to mitigate or eliminate formation damage in the near-wellbore region, thereby improving the productivity index and well performance. In Haoud Berkaoui (HBK) fields, formation damage predominantly arises from drilling mud invasion and the migration of fine particles within the reservoir rock.
Various acid systems are proposed by service companies to restore permeability around the wells, but not all of them are suitable for the formations type and the reservoir fluids. Some acid systems can worsen the situation.
The main objective of this study is to examine the different acid systems used in the fields and analyze their effects on the formations and reservoir fluids in order to choose the optimal acid system with the fewest side effects.
Based on comprehensive laboratory tests conducted on rock sample from HBK wells assessing the compatibility of acid systems with the formation mineralogy, along with an analysis of the historical treatment data from HBK wells, we propose a refined methodology for enhancing matrix treatment and an optimal treatment strategy for the Haoud Berkaoui region.
The findings indicate that the acid system S.A.1 (comprising 6% HCl and 1.5% HF) is the most effective choice for the HBK region, as it demonstrates compatibility with the formation and its fluids while inducing fewer secondary reactions. The success of the acidification operation depends not only on the type of acid used but also on its volume.

Keywords: Haoud Berkaoui, Formation Damage, Acidification, Acid System, Reservoir Treatment.

Synthesis and characterization of ZnO nanoparticles in 1- methyl-3-propylimidazolium iodide ionic liquid

Ghania DEKKICHE [1], Abdelkader BENABDELLAH [2], Yassine CHAKER [3], El- Habib Belarbi [4] , Mansour DEBDAB [5], Noureddine HARID [6]

[1.2.4.5] Synthesis and Catalysis Laboratory, University of Tiaret, B.P 78, 14000, Tiaret, Algeria.

[3]Department of Chemistry, Université of Tissemssilt 38000, Algeria.
[6]APEC Centre, Department of Electrical and Computer Engineering, Khalifa University,Abu Dhabi 127788, United Arab Emirates.

ghania.dekkiche95@gmail.com

Abstract. In this work, Zinc oxide nanoparticles (ZnO NPs) are synthesized via a simple sonochemical reaction by using 1-methyl-3-propylimidazolium iodide as ionic liquid (IL) for obtained (ZnO NPs + IL). Characterization of the obtained product's structure, morphology, and chemical was confirmed by X-ray diffraction, FTIR spectroscopy, and scanning electron microscope (SEM). The results for the formed products exhibit the hexagonal wurtzite structure ZnO NPs, and these samples' average crystallite size is estimated to be around 12-19 nm. FTIR spectra show the Zn-O bond clearly which confirms the structure of ZnO.

Keywords: Ionic liquid, Zinc oxide, Sonochemical, X-ray diffraction, Nanoparticles.

Determination of petrophysical properties of oil reservoir based on well log data: Application on well AMA-74 inTFT Region-Algeria

MESSAOUDI Hadjer (1), TAOUTIMed Benabdallah (2) and HADJADJAsma (3)

University Amar Telidji-Laghouat- Faculty of Technology, Department of Process Engineering
h.messaoudi.gpr@lagh-uni.dz

Ministry of Higher Education and Scientific Research
University of Ghardaia
Sciences And Technology Faculty
Laboratory of Materials, Energy Systems Technologies and Environment (MESTEL)
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Abstract. Petrophysics is the science dealing with the fundamental chemical and physical properties of porous media, and in particular of reservoir rocks and their contained fluids. These include storage and flow properties (porosity, permeability and fractional flow), fluid identification, fluid phase distribution within gross void space (saturation), interactions of surface forces existing between the rock and the contained fluids (capillary pressure), measurements of pressure, stress conditions, electrical conductivity of fluid-saturated rocks, etc. These properties and their relationships are used to recognize and assess hydrocarbon reservoirs, source rocks, cap rocks, and aquifers.
The knowing the petrophysical properties of the oil reservoir is essential and necessary because without knowing them there can be no production.
In this paper, we have presented various well log data for to find both the porosity and saturation of the reservoir, the study was applied based on information from a well AMA-74 inAMASSAK Field (inTFT Region), than we used Matlab and theTechlog 2015.3 software which is a Windows software platform owned by Schlumberger and intended to consolidate all borehole information, It allows the user to interpret all logs and master data. We will present the results obtained for this well, where we concluded that its saturation of water value (Sw) = 78.2 %, saturation of oil value (So) =28 % and the porosity value =7.2%.

Keywords: Porosity, Petrophysical, Saturation, logging, reservoir.

Improving the Leak-Tightness of Casing Joints by Increasing the Accuracy of Thread Machining

Oleh Onysko [1[0000-0002-6543-9554]] , Volodymyr Kopei [2[0000-0003-0008-8260]] , Abderrahmane Bellaouar [3[0000-0002-9233-482X]] , Michal Bembenek [4[0000-0002-7665-8058]]

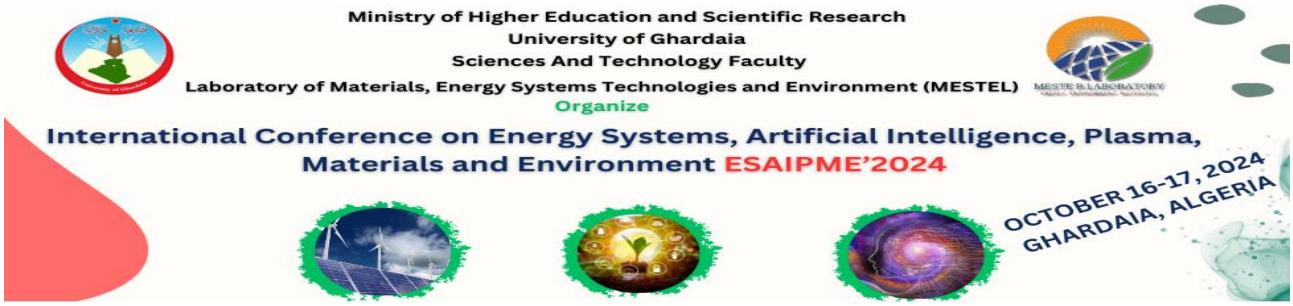
[1,2] Department of Computerized Mechanical Engineering, Ivano-Frankivsk National Technical University of Oil and Gas, Karpatska str., no. 15, Ivano-Frankivsk 76019, Ukraine
1 oleh.onysko@nung.edu.ua, 2 vkopey@gmail.com
[3] MESTEL Laboratory, University of Ghardaia, Scientific Zone, BP 455, Ghardaia 47000, Algeria
[3] ar.bellaouar@univ-ghardaia.dz
[4] Department of Mechanical Engineering and Robotics, AGH University of Science and Technology in Kraków, 30 Mickiewicza Avenue, 30-059 Krakow, Poland

bembenek@agh.edu.pl

Abstract. Casing pipes of oil and gas wells and their coupling connections are made of steels of different strengths, and some of them belong to materials that are difficult to machining during the manufacture of connecting threads. Therefore, the standards provide a number of dimensions that determine the thread profile depending on the geometry of the tool for their manufacture. These sizes include the screw gap between the crest of the thread on the pipe and the root on the coupling, as well as vice versa. On the other hand, one of the main parameters that determine the accuracy of the thread is its profile angle of 30°±1°15'. This tolerance may also be caused by the difficulty of thread production and at the same time may lead to an increase in the clearance. Hydraulic modelling of the joint in the casing pipe indicates the need to prevent such a significant increase in gaps, as it is the reason for the negative result of pressing under the condition of standard pressures. It is proposed to improve the geometric parameters of thread cutting tool to decrease the tolerance. Reducing the tolerance by three times allows you to reduce the maximum speed of water in the gap by 8.5-14%, and the average by 7.6-9.1%. An additional reduction in speed can be achieved by using a sealing wire made of porous plastic material.

Keywords. Thread Profile, Pressure, Conical Helix, CFD, Fluid velocity, Gap, Tolerance.

Implementation a High Order Sliding Mode Control for Maximum Power Point Tracking (MPPT) in Wind Energy Conversion Systems



Abdelaziz Belhait [*] ,Messaoud Louafi [2] ,Sihem Ghoudelbourk [3] Ghoulemallah Boukhalfa [4] Abdesselem Chikhi [5] Abdessmad Milles [6] Hamiani Hichem [7]

[1-2] Electromechanical Department, Environment Laboratory, Mining Institute, Echahid Cheikh Larbi Tebessi University

[3] Electrical Department,University Badji Mokhtar, Annaba, Algeria

[4] Department of Electrical Engineering, Faculty of Sciences and technology, University of Batna, 05078 Batna, P.O.B. 53, Algeria

[5] Department of Electrical Engineering, Faculty of Technology, University of Batna2, Fesdis, Algeria

[6] Laboratory of Materials Physics, Radiation and Nanostructures (LPMRN), Bordj Bou-Arteridj, Algeria

[7] Department of Electrical Engineering, LESTER Laboratory, Nour Bachir University, El Bayadh, Algeria.

abdelaziz.belhait@gmail.com

Abstract. In the field of renewable energy, achieving the Maximum Power Point (MPPT) is crucial for optimizing wind energy production. The goal of this article is to offer a non-linear, chatter-free solution that is both reliable and effective. To maximize the production of variable-speed wind energy, the Super-Twisting Sliding Mode Control (STSMC) is the ideal method for attaining optimal performance and minimizing energy losses. The STSMC control was developed to maximize aerodynamic torque and enhance the dynamic performance of the Wind Energy Conversion System (WECS). It directly tracks the electromagnetic torque of the Doubly Fed Induction Generator (DFIG) in line with the recommended regulation for optimal power utilization. The article contrasts the STSMC control method with traditional sliding mode controller. Notable features of the proposed STSMC algorithm include finite convergence time, robustness against system disturbances and parameter variations, and reduced chattering.

Keywords: DFIG-based wind energy systems, Maximum Power Point Tracking (MPPT), Tip Speed Ratio (TSR), Super-Twisting Sliding Mode Control (STSMC).

Investigation of an InGaN/Si-Based Heterojunction Tandem Solar Cell

Lakhdar Sek [1]

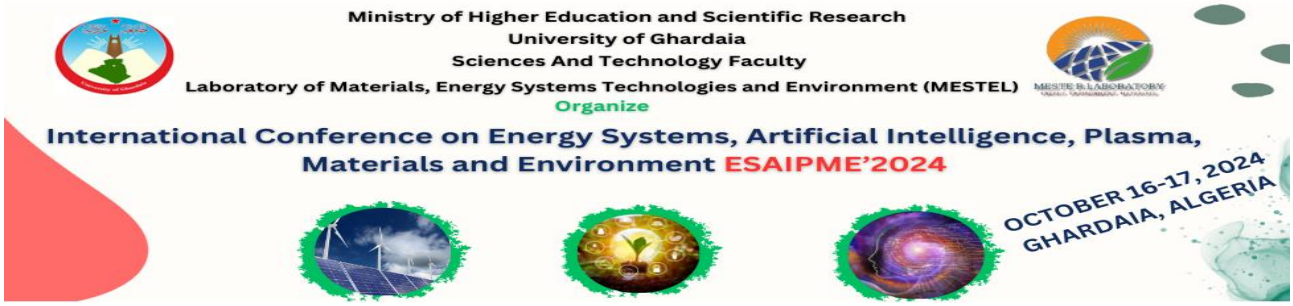
1 Laboratory of New Technologies and Local development, Faculty of Technology, University of ElOued- Algeria.

sek-lakhdar@uni-eloued.dz

Abstract. This study explores the design and performance of a heterojunction tandem solar cell comprising Indium Gallium Nitride (InGaN) and Silicon (Si) layers. The integration of InGaN with Si aims to exploit the complementary absorption spectra of the two materials, thereby enhancing overall solar energy conversion efficiency. InGaN, with its tunable bandgap, serves as the top cell, effectively capturing high-energy photons, while the Si bottom cell absorbs the remaining lower-energy photons. Through detailed simulations and experimental evaluations, we demonstrate significant improvements in efficiency compared to traditional single-junction Si solar cells. The analysis includes optimization of the InGaN composition, thickness, and interface quality to minimize
recombination losses and maximize current matching between the sub-cells. Our findings indicate that the InGaN/Si tandem configuration can achieve efficiencies exceeding 30%, showcasing its potential as a viable candidate for next-generation photovoltaic technologies. This research provides valuable insights into material selection, device architecture, and fabrication techniques critical for advancing high-efficiency solar cell development.

Keywords: Heterojunction, Tandem solar cell, Indium Gallium Nitride (InGaN), Silicon (Si).

Data Management Interface for Temperature Control with SMART-MAIC D105-12



Cristian Barz [1[0000-0001-8028-2981]], Alexandru-lulian Bendrea [2[]] , Daniel Danci[3[0009-0001-2746-3588],] Oleh Onysko[4[0000-0002-6543-9554]], Volodymyr Kopei[5[0000-0003-0008-8260],] Abderrahmane Bellaouar[6[0000-0002-9233-482X]]
[1,2,3] Technical University of Cluj Napoca, CUNBM, Baia Mare, Romania
1 cristian.barz@ieec.utcluj.ro
[4,5] Ivano-Frankivsk National Technical University of Oil and Gas, Karpatska str.,15, Ivano-Frankivsk 76019, Ukraine
[4] oleh.onysko@nung.edu.ua , 5 vkopey@gmail.com
[6] MESTEL Laboratory, University of Ghardaia, Scientific Zone, BP 455, Ghardaia 47000, Algeria
ar.bellaouar@univ-ghardaia.dz

Abstract. The DataCollection project develops an application for environmental data management, focused on temperature monitoring in different residential spaces. The importance of the project derives from the need to improve energy efficiency and home comfort through the efficient collection and management of information:Significant contributions of the project include the implementation of an intuitive interface for the administrator, the enabling of SQL-based data and data management, along with robust export functionalities in CSV and Excel formats and the automatic generation of associated graphs. Advantages include real-time data updates, automatic communication of changes to users and efficient resource management. Limitations of the project are the e-mail address of the users to ensure data security. The implementation of the project includes rigorous error handling and ensuring data integrity contributing to a smooth and intuitive user experience when using the DataCollection application.

Keywords: Monitoring, Temperature, Data management, Data analysis, MQTT

The Effects of Partial Shading on PV Arrays

Guerrida Laid [1] , Nadji Hadroug [2] , Abdelhamid Iratni [3] , Khaldi Belgacem Said [4] and Hafaifa Ahmed [5]

[1] Applied Automation and Industrial Diagnostics Laboratory ,University of Ziane Achour in Djelfa, Algeria.
laid.guerrida@univ-djelfa.dz
[2] Applied Automation and Industrial Diagnostics Laboratory, University of Djelfa 17000 DZ, Algeria
n.hadroug@univ-djelfa.dz
[3] University Mohamed El Bachir El Ibrahimi of Bordj Bou Arreridj, 34030 DZ, Algeria
iratni@univ-bba.dz
[4] Applied Automation and Industrial Diagnostics Laboratory, University of Ziane Achour in Djelfa, Algeria.
bs.khaldi@univ-djelfa.dz
[5] Applied Automation and Industrial Diagnostics Laboratory, University of Djelfa 17000 DZ, Algeria
hafaifa.ahmed.dz@ieee.org

Abstract. Partial shading is a prevalent issue in photovoltaic (PV) systems, occurring when different modules within the array receive varying levels of irradiance due to obstructions such as nearby buildings, trees, or other objects. This phenomenon can substantially diminish the overall performance of the system. This study aims to examine the effects of partial shading on the performance and efficiency of PV arrays. To this end, simulation models are employed to assess the performance of PV array configurations under various shading conditions. MATLAB is utilized to conduct the simulations and present the results.

Keywords: Partial Shading, MATLAB, PV arrays, Performance and efficiency of PV arrays

Aspen Plus Software Application for the Numerical Simulation of Biomass Waste Gasification

Bahmed Fekhar[1;]MohammedAl-Asadi[2]
[1]University Of Ghardaia; Faculty of Science and Technology; Algeria

fekharphd@gmail.com.
[2]Department of Chemistry, College of Science, University of Misan; Iraq
al-asadim@uomisan.edu.iq

Abstract. Date palm trees are broadly cultivated in Algeria due to their significant nutritional value. Presently, the biomass waste produced by date palms is frequently disposed of in methods that lack environmental sustainability; however, this waste has potential for hydrogen production through gasification. This process is recognized as a practical method for thermochemically converting solid biomass into biofuels, Taking into account elements such as the initial capital outlay, operational expenditures, and energy usage. Additionally, Aspen Plus has become a widely utilized software for process simulation across both academic institutions and industrial applications. Over the past decade, there has been a significant rise in the number of research articles dedicated to the modeling of biomass gasification using Aspen Plus. Utilizing Aspen Plus for the gasification of date palm waste necessitates the creation of a steady-state model that condenses intricate reactions into more comprehensible unit operations. This model provides significant insights into the composition of syngas and facilitates the prediction of the impact of different operating conditions on gasification efficiency, thus advancing the sustainable utilization of agricultural waste.in this research a comprehensive gasifier model in Aspen Plus is developed exploiting the RYield and RCSTR (Continuous stirred-tank reactor) reactor configurations to evaluate the performance of the improved gasifier.The results obtained from the Aspen Plus simulation demonstrate a strong correlation with the experimental findings regarding product yields and gasification efficiency, thereby indicating the reliability of the Aspen Plus model.

Keywords: biomass; waste; aspen plus; gasification;simulation; date palm

Environmentally Friendly Treatment of Oil-Based Drilling Waste Using Thermal Desorption Method focus on Energy Balance

B.ZITANI[1] and B.BEKKAR[2]and MN.AZIEZ[1] and CA.MOSBAH[2]

[1] Ghardaia University, Scientific zone, Bounoura, Ghardaia, ALGERIA

zitani_brahim@yahoo.fr

Abstract. Thermal desorption is method used to treat contaminated soils with hydrocarbons with the aim of eliminating pollutants. This technique is based on the degradation of molecules under the effect of increasing temperature. It is applied to volatile and semi-volatile compounds or less volatile organic compounds by increasing the temperature and extract them as gas phase, followed by condensation.

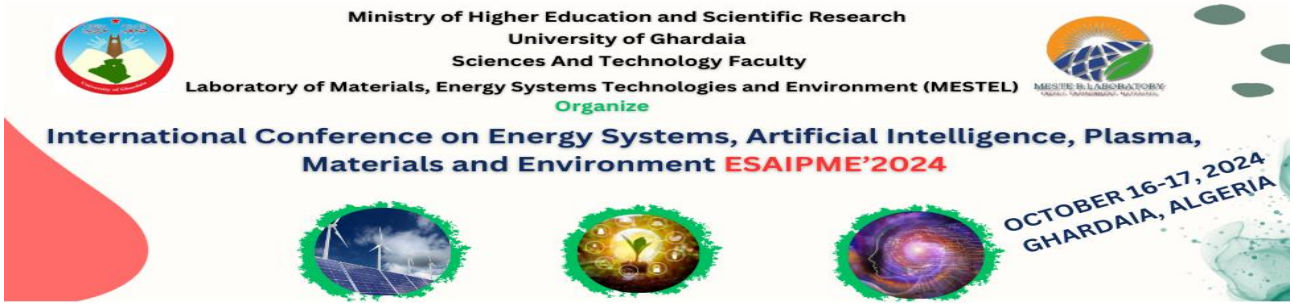
Thermal desorption can be applied on-site or in a centralized plant where excavated contaminated soils are transported to the treatment facility, the excavated soils are heated in a furnace at a temperature ranging from 90°C to 560°C. This heating allows for the desorption of contaminants adsorbed on the soil matrix and the increase of the vapor pressure of the less volatile compounds to extract them into the gas phase. The depolluted soils retain their physical properties.

The purpose of the energy balance of the process is to determine the cost of fuel per ton of waste treated, taking into account the diesel recycled from typical drilled oil well in Algeria. Two levels are distinguished: low-temperature desorption (up to 320°C) and high-temperature desorption (up to 560°C), which is applied to oil waste.

Keywords: Drilling Waste Management, Thermal desorption

Optimizing Energy Efficiency: A Numerical Analysis of Solar-Powered Absorption Cooling with Thermal EnergyStorage"

ALIOUAT Khadra[1, a *] ,CHERRAD Noureddine[2,b] ,Meneceur Noureddine,[2,c]



Faculté des Sciences Appliquées Université Kasdi Merbah, Ouargla

[a] djahidaaliouat17@gmail.com
[b] chernoured@gmail.com
[c] meneceur-noureddine@univ-eloued.dz

Abstract: The increase in energy consumption in the world has created an urgent need to find new ways to use energy resources more efficiently and rationalize solar energy, as it is a non-polluting, inexhaustible and affordable energy source. In real-world applications, intermittent solar energy remains the main pain point that raises the issue of the need for storage. Energy as a solution. Thermal energy storage (TES) plays an important and essential role in making energy use more sustainable for space heating and cooling, solar energy harvesting, solar thermal generation and other applications. In this article, we focus on studying the absorption cycle. We conducted a numerical analysis to study the effect of the main factors on the machine‟s performance parameters. The necessary heat and mass transfer equations and appropriate equations that describe the properties of the working fluids were determined. This study was conducted using variable operating temperatures and different values of absorption temperature and condensation temperature for constant pressure content. The obtained results showed that the performance of the proposed system improves by increasing the operating temperatures of the generator, and the results also showed that the best coefficient is achieved by decreasing the absorption and condensation temperatures.

Key words: adsorption; lithium bromide; performance; condensation.

Reducing Irreversibilities in Mini-Channel Solar Collectors: A Computational Investigation into Optimal Working Fluid Choices.

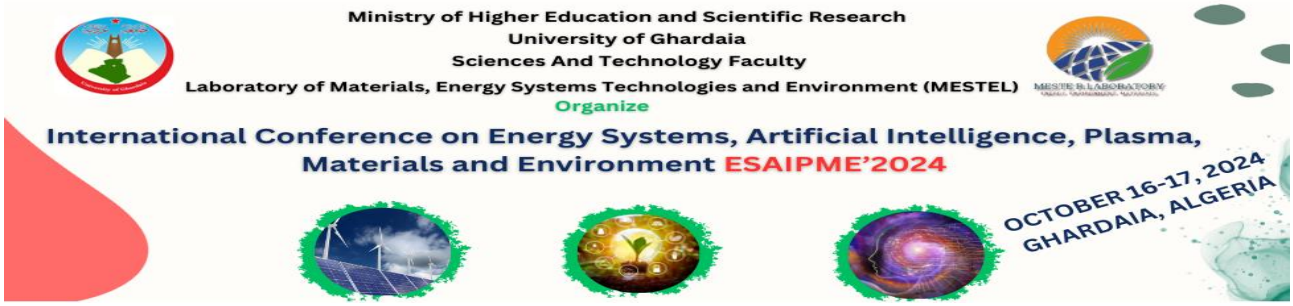
L.BOURAGBI[1], N.LEKOUAGHET[2], R.KHADRAOUI[3]. B.MAHFOUD[4], B.ZITANI[5],

[1]University of 20th August 1955-Skikda, Algeria
[2]University of 8th May 1945-Guelma. Algeria
[3]Badji Mokhtar - Annaba University Algeria,
[4]Akli Mohand Oulhadj University of Bouira, Algeria
[5]Université of Ghardaia, Algeria

bouragbilakhdar@gmail.com

Abstract. The present work employs numerical simulations, leveraging user-defined algorithms and parallel computing techniques, within a finite volume computational fluid dynamics (CFD) framework. The primary objective is to conduct an entropy generation analysis and identify the most suitable working fluid for minimizing irreversibilities in a minichannel flat plate solar collector (MFPC) under steady-state laminar convective flow conditions, considering the influence of solar radiation. The investigation encompasses a comprehensive evaluation of various nanofluids, including Al2O3-H2O, CuO-H2O, and Fe3O4-H2O, as well as conventional fluids such as water and methanol. The simulations yield compelling results, conclusively establishing the CuO-H2O nanofluid as the optimal choice, exhibiting minimal entropy generation compared to the other working fluids under consideration. Consequently, the utilization of the CuO-H2O nanofluid significantly enhances heat transfer performance and reduces irreversibilities within the MFPC system.

Keywords: Entropy generation, Minichannel solar collector, irreversibility, nanofluid, solar radiation, computational fluid dynamics (CFD).



A numerical investigation on the cooling applications of horizontal air-to-ground heat exchangers.

Kheira Belhamideche[1] , Nadia Laredj[1,2] , Mustapha Maliki[1,2] , Missoum HANIFI[1,2] , Djihad Bennaceur[1] , Mahi Eddine Brahimi[1]

1 Laboratory of Construction, Transport and Environmental Protection LCTPE, University of Mostaganem
2 Department of Civil Engineering, Faculty of Science and Technology, University of Mostaganem

belhamideche1805@gmail.com

Abstract. Ventilation using ground-to-air heat exchangers is an efficient solution for heating and cooling the air supplied to a building. This study presents a numerical simulation of the performance of a horizontal air-to-ground heat exchanger system (HAGHE) for cooling buildings. A 3D transient numerical model based on the finite element method created using COMSOL MULLTIPHYSICS software. The model developed takes into account the interaction between soil and atmosphere, all climatic and geological conditions are considered for the Mostaganem region. The model evaluates the coupling of heat and moisture transfer for an unsaturated soil. The results indicate that neglecting the interaction between the atmosphere and the ground for heat exchangers installed at shallow depths can overestimate the performance of these systems. The HAGHE system's heat exchange rate with the environment in cooling mode is 500W with a coefficient of performance of 5,9.

Keywords: Renewable energy, Heat Transfer, geothermal, Heat exchanger, shallow depth.

Electrochemical Corrosion Behavior by ZnO and TiO2 thin films deposited On Carbon Steel

Fatiha Chelgham[1,2], Maroua Brella[3],Adel Taabouche[4,5],BrahimGharbi[2,3],Amira Ouakkaf[6], Mounira CHELGHAM[7], Souheyla BOUDJEMA[8]

[1] Laboratory for the Valorization and Promotion of Saharan Resources, Kasdi Merbah University, 30000 Ouargla, Algeria
[2] Faculty of hydrocarbons, renewable energies, science of the earth and the universe, KasdiMerbah University, Ouargla, 30000, Algeria
[3]Laboratory of Radiation and Plasmas and Surface Physics (RPPS), KasdiMerbah University, Ouargla, 30000 Algeria
4 Thin Films and Interfaces Laboratory, University of FrésMentouri Constantine, Constantine, 25000 Algeria.
[5] Département de Physique et Chimie, Ecole Normale Supérieure El Katiba Assia Djebar Constantine, Constantine, Algeria
[6]Faculté Des Sciences Exactes, Université Mohamed Khider, Biskra-07000, Algerie.
[7]Développement des énergies nouvelles et renouvelables dans les zones arides et sahariennes, LENREZA, Ouargla 30 000, Algeria
[8]Laboratory of Catalysis and Synthesis in Organic Chemistry, Tlemcen University, BP 119,Imama, Tlemcen, Algeria.

fchelgham@gmail.com

Abstract. The abstract A spray pyrolysis technique (SPT) was successfully used to deposited ZnO and TiO2 thin film on API N 80 (American Petroleum Institute) carbon steel. The morphology and chemical constituents of steel and the thin film were characterized by X-ray diffraction (XRD) and Fourier Transforms Infrared Spectroscopy (FTIR). The corrosion resistance of the films was measured by the potentiodynamic polarization study. XRD analysis indicates that ZnO films have a high-crystalline quality hexagonal wurtzite structure with a strong c-axis orientation. However, in the case of the N80 steels was samples crystallize in a ferrite-like structure with a strong orientation (110). We remarked that all samples the ZnO on glass

and N80 are a nanometric grain size, the values of grain sizes given in the range from 43 to 48 nm .The coated ZnO and TiO2 thin films improved the corrosion resistance of the N80 steel as seen from the electro- chemical test result.

Keywords: TiO2, ZnO, thin films, Corrosion, API N 80 carbon steel.

Energy efficiency integration of off-grid photovoltaic systems

S. Belgherras [1] , S.M.A. Bekkouche [2] , H.Y. Seba [3] , N. Benarouba [3]

1 Faculté des Sciences et Technologie, University of Ghardaïa, BP 455 Airport Road, Noumerate, Ghardaïa, Algeria
2 Unité de Recherche Appliquée en Énergie s Renouvelables, URAER, Centre de Développement des Energies Renouvelables, CDER, 47133, Ghardaïa, Algeria;
3 Materials, Energy Systems Technology and Environment Laboratory MESTE, Faculté des Sciences et Technologie, University of Ghardaïa, BP 455 Airport Road, Noumerate, Ghardaïa, Algeria

sifiabelgherras1@gmail.com

Abstract. The desired efficiency of photovoltaic systems depends on many factors as well as understanding the functionality and configuration of the components. The aim is to reduce energy consumption by integrating a standalone photovoltaic system. A comparative study was conducted on two houses, one with a high level of energy consumption and the other an energy-efficient house. The configuration that maximized performance measures and gave the best price has been selected. The subsequent work will be based on the most economical estimate. The rate of energy savings achieved by integrating this system has shown that this concept is more cost-effective in low-energy housing. As the electrical load retained by the user's increases, the estimated total cost of the whole installation increases linearly. An increase of 0.5 kWh in the supply load results in an additional investment of almost 18 million centimes.
Keywords: Energy efficiency, Standalone photovoltaic system, Electrical load, Low-energy housing, Energy-efficient house, Economical estimate.

Tandem Use of the Improved Downhole Motor Support and Plate Shock Absorber for Drilling Geothermal Wells

Andrii Velychkovych [1 [0000-0003-2685-8753]], Liubomyr Ropyak [2 [0000-0002-9374-2550]], Abderrahmane Bellaouar [3 [0000-0002-9233-482X]]

[1] Department of Construction and Civil Engineering, Ivano-Frankivsk National Technical University of Oil and Gas, 15 Karpatska Str., 76019 Ivano-Frankivsk, Ukraine
a_velychkovych@ukr.net
[2] Department of Computerized Mechanical Engineering, Ivano-Frankivsk National Technical University of Oil and Gas, 15 Karpatska Str., 76019 Ivano-Frankivsk, Ukraine
l_ropjak@ukr.net
[3] MESTEL Laboratory, University of Ghardaia, Scientific Zone, BP 455, Ghardaia 47000, Algeria
ar.bellaouar@univ-ghardaia.dz

Abstract. Modern geothermal projects require efficient drilling of deep wells in complex engineering and geological conditions. The rocks in which geothermal wells are constructed are usually metamorphic or igneous (hard and extremely difficult to drill), and high temperatures have a significant impact on drilling tools. Drill bits generate a wide range of vibrations during forced operation, and the phenomenon of interaction between the drill string and the borehole walls causes the development, amplification and interconnection of vibrations of different classes. The result is the occurrence of emergencies, in particular, due to damage to the multi-row support of downhole motors. The authors have developed an improved design of a multi-row support for the downhole motor spindle, which ensures uniform load distribution across the rows. This effect is achieved due to the structural and deformable features of additional elastic rings that contact the rims of the multi-row bearing along the conical surfaces. In this case, the load is distributed over the bearing rows in proportion to the stiffness of the elastic rings. In order to extend the service life of such multi-row bearings, it is proposed to use them in conjunction with a drill shock

absorber. A model of a heat-resistant elastic element of a drill shock absorber has been developed, and the performance characteristics of the proposed vibration protection device have been evaluated.

Keywords: Geothermal projects, Multi-row bearing, Elastic rings, Cone surface, Plate, Elastic element.

Impact of Albedo Factor on the Performance of Bifacial PV Modules

Mosbah Charaf Abdelkarim[1], Zitani Brahim[2]

[1]Laboratoire des matériaux, technologie des systèmes énergétiques et environnement, Université de Ghardaïa
[2]Faculté des Sciences et Technolgies, Université de Ghardaia

Abstract. The energy performance of bifacial photovoltaic (PV) modules is significantly affected by the albedo, or the reflectivity of surfaces surrounding the installation site. Unlike traditional monofacial modules, bifacial modules can capture sunlight from both the front and rear sides, making the albedo a critical factor in determining their overall efficiency. This study explores the influence of various albedo conditions—such as snow, desert sand, vegetation, and urban surfaces—on the energy yield of bifacial PV systems. Through case studies and field data analysis, the study examines how environmental surfaces with different reflectivity levels impact the rear-side irradiance, contributing to increased energy output. It also highlights the seasonal and geographical variations that can alter albedo, offering insights into optimal site selection and system design. The results demonstrate that understanding and leveraging albedo effects can lead to improved energy production, particularly in regions with highly reflective surfaces. This study provides a comprehensive overview of how bifacial PV modules can be better integrated into diverse environments to enhance their long-term performance and economic viability.

Keywords: Bifacial Photovoltaic Modules, Albedo Factor, Energy Performance, Environmental Impact

Bifacial PV Modules: Current Challenges and Opportunities

Mosbah Charaf Abdelkarim[1], Zitani Brahim[2]

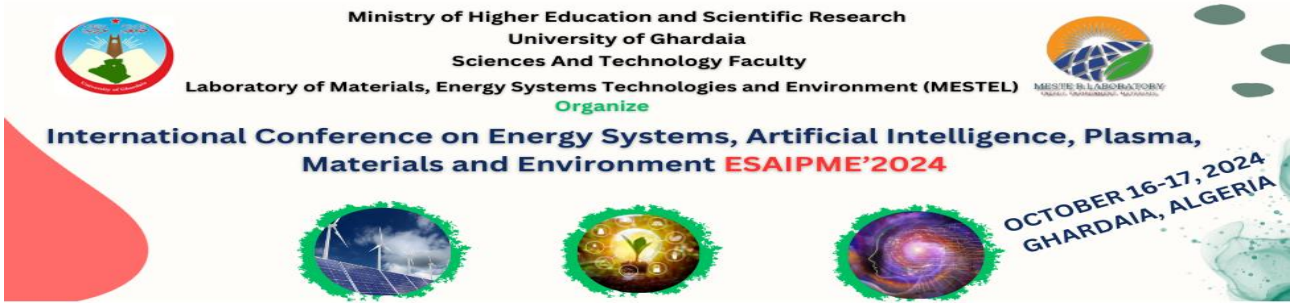
[1]Laboratoire des matériaux, technologie des systèmes énergétiques et environnement, Université de Ghardaïa
[2]Faculté des Sciences et Technolgies, Université de Ghardaia

Abstract. The adoption of bifacial photovoltaic (PV) modules has gained significant momentum in recent years due to their potential for enhanced energy yield by capturing sunlight on both sides. Despite their advantages, the integration of bifacial technology presents numerous challenges that hinder widespread adoption. This study will explore key issues such as optimal installation conditions, site-specific performance variability, accurate irradiance modeling for both surfaces, and the complexities of degradation patterns in diverse climates. Furthermore, the study will address economic viability, highlighting the cost-benefit analysis of bifacial PV systems compared to traditional monofacial modules. By examining the latest advancements and ongoing research, this presentation aims to provide a comprehensive understanding of the technical and operational hurdles faced by bifacial PV modules, as well as strategies for overcoming them in future deployments.

Keywords: Bifacial Photovoltaic Modules, Energy Yield Optimization, Irradiance Modeling, Solar Technology Challenges

Predictive Modeling of Swirl Flow in Combustion Chambers : AI Approaches to Enhance Energy Efficiency.

Bellaouar Abderahmane[1], Djemoui Lalmi[1], Kifouche Abdessalem[2] and Redjem Hadef [3]



[1]*Laboratory of Materials, Energy Systems Technology and Environment, Faculté des Science et Technologie,*
[2]*Département d'automatique et électromécanique Université de Ghardaia, Algeria*
[3]*Departement génie mécanique, Université l'Arbi ben m'hidi, Oum el Bouaghi, Algeria*

Abstract. From time immemorial, humanity has strived to advance in transportation and energy efficiency, aiming to achieve optimal energy use while minimizing environmental impact for improved overall performance. In the field of combustion, the discovery of swirl or vortex flow stands as one of the most significant breakthroughs of the last century, given its critical role in enhancing combustion processes. Swirl flow improves combustion efficiency by intensifying the mixing of fuel and air, leading to more complete and stable burning. This feature is essential for reducing emissions and increasing energy output, making it a central focus of ongoing research.This study investigates the potential of artificial intelligence to predict the characteristics of swirl flow within combustion systems. By using experimental data, including both descriptive and positional inputs, and predicting outputs such as horizontal, vertical, and kinetic energy at various positions within the combustion chamber, the model aims to understand the spatial and dynamic behaviors of swirl flow.Results indicate that the model accurately captures the spatial characteristics of the vortex flow field and learns the relationship between input and output parameters effectively. The predicted velocity density distribution and vortex center positions align well with experimental observations, demonstrating the model's high predictive accuracy and ability to reconstruct the swirl flow field. Additionally, it shows promising generalization, with the ability to perform inductive predictions on previously unseen data.
This study highlights the potential of AI-based models in refining combustion processes through accurate prediction of swirl flow characteristics, opening pathways for new architectures that could further enhance combustion efficiency and sustainability.

Keywords: Prediction turbulent Swirling flow, combustion, Artificial neural network, training and validation

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OCTOBER 16-17, 2024
GHARDAIA, ALGERIA

Thermal Transfer

Three-dimensional simulation of CPU heat sinks performance having perforation space and splitters supplement

Djamel Sahel[*,1,2], Brahim Bencherif [2]

[1] LCGE Laboratory, University of Sciences and Technology of Oran, Mohamed Boudiaf, Oran-Algeria.

[2] Faculty of Technology, Amar Telidji University of Laghouat-Algeria.

[1] djamel_sahel@ymail.com

Abstract. The increase in the heat dissipation rate in heat sinks (HSs), the reduction of the occupied volume and mass, and the elimination of the lower heat transfer areas (LHTAs) behind the pins are the main parameters to be controlled in HSs design. For this purpose, this study is devoted to numerically investigating the effect of the combination between perforation technique and splitters inserts on the heat dissipation and turbulent fluid flow characteristics of pin fins heat

sinks (PFHSs). The splitter is located in the back of the pin, and the cylindrical pin fins heat sinks (CPFHSs) are perforated with different pairs of hole numbers. These configurations are named PFHS-0 (without perforation) to PFHS-5. The results obtained for the PFHS-5 show an increase in Nusselt number by 34.91% and a reduction in the thermal resistance by 24.22%, compared with CPFHSs. For the same conditions, the occupied volume and mass of this case are also reduced by 70% and 47.5%, respectively. In addition, the PFHS-5 case ensures the highest hydrothermal performance factor (HTPF) of 1.42 at Re = 8,740.

Keywords: Heat sink, CPU, splitter, thermal resistance, heat transfer.

Analyzing Thermal Heat Exchanges in a Concentric Tube Heat Exchanger through Simulation

A.TRABELSI[1]and D.LALMI[2] and B.ZITANI[1]

[1]Process Engineering Department, *Sciences and Technology Faculty, Université de Ghardaia, Algeria*
[2]*Laboratory of Materials, Energy Systems Technology and Environment, Sciences and Technology Faculty, Université de Ghardaia, Algeria*
Prof.am4741@gmail.com

Abstract. The study involves experimental and numerical work on thermal exchanges occurring in a concentric tube heat exchanger.

Experimental measurements were conducted using a test rig located in the Laboratory of Process Engineering 2 at the University of Ghardaïa. Two fluid circulation modes in the exchanger were considered: co-current and counter-current, under different boundary conditions.

On the other hand, the three-dimensional mathematical model of the flow in the exchanger was numerically solved using the commercial CFD software ANSYS 2019 R1.

The obtained numerical and experimental results were close. This work has enhanced our understanding of the operating principles and the thermal exchange phenomenon in heat exchangers. It has been demonstrated that the counter-current mode was the most efficient.

Keywords: – Concentric tube heat exchanger; Numerical simulation; Co-current and counter-current flow; Convection; Efficiency.

Bright Soliton in a box under the impact of generalized momentum operator.

First Abdelhakim Benkrane

[1] Université Kasdi Merbah Ouargla, Laboratoire LRPPS, Ouargla 30000, Algeria
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Abdelahkim.benkrane@univ-ouargla.dz

Ministry of Higher Education and Scientific Research
University of Ghardaia
Sciences And Technology Faculty
Laboratory of Materials, Energy Systems Technologies and Environment (MESTEL)
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Abstract. This paper investigates the influence of the generalized momentum operator bright soliton confined within an infinite potential well, described by a deformed one-dimensional Gross–Pitaevskii equation (GPE). Exact solutions are derived, and the impact of this generalization of momentum operator on atomic density is explored. The study reveals significant changes in the probability density and energy spectra, depending on the deformation parameters...

Keywords: Gross–Pitaevskii equation, , Jacobi elliptic functions, generalized momentum operator.

Filtration flux improvement in a membrane tube fitted with hemispherical baffles

Djamel Sahel[*,1,2], Warda Boudaoud [2], Houari Ameur [3]

[1] LCGE Laboratory, University of Sciences and Technology of Oran, Mohamed Boudiaf, Oran-Algeria.
[2] Faculty of Technology, Amar Telidji University of Laghouat-Algeria.
[3]Department of Technology, University Centre of Naama, Naama, Algeria

[1] djamel_sahel.@ymail.com

Abstract.A numerical investigation carried out to examine the effect of a new baffles design in a membrane tube on the turbulent flow, using CFD code FLUENT ANSYS. Two different orientation of semi-sphere baffles termed as LO baffle for the right orientation and RO baffle for the left orientation respectively. Axial velocity, stream function, static pressure, wall shear stress and turbulent characteristics are the physical parameters utilized to evaluate the filtration performances. The numerical results show that the presence of an array of semi-sphere baffles can develop the local shear stress on the membrane surface and creates the eddy movement which considerably enhance the filtration performance. In addition, the LO baffle case achieves 96% of filtration flux rate compared with tube without baffles. The experimental estimation was realized through cross-flow microfiltration of titanium dioxide suspension which illustrated a good agreement with the CFD analysis.

Keywords.CFD, turbulent flow, membrane tube, filtration, hemi-sphere baffle.

Simulation Study of Steady-State Temperature Distribution in an Oil-Cooled Annular Transformer

Ismail Ghozlane [1]Belkacem Yousfi [2[1]], Tahar Seghier [2[2]], Abderrahmane Younes [2[3]] and Ahmed Hadjadj[2[4]].

[1] University Amar Tledji, Algeria

i.ghozlane@lagh-univ.dz

Abstract. The research presented in this paper investigates the simulation of steady-state temperature distribution within an oil-cooled annular transformer. This study specifically examines the temperature distribution within the transformer submerged in oil. To address this issue, we employed the weakly compressible Navier-Stokes equations in conjunction with general heat transfer principles. We can use this approach to analyze how temperature distribution is affected by changes in the fluid's thermal conductivity and determine how spatial changes affect it.

Keywords. Thermal conductivity, Oil, Transformer, Heat transfer, Fluid.

An experimental investigation aimed at utilizing ambient air convection within a channel to cool a horizontal aluminum cylinder

Tahtah Reda [1], Hamaimi Khaoutar [1], Kaddour Abdelmajid [2], Blaghit Abdelhakem [1] and Khirennas Messaoud [1]

[1] Département d'automatique et d'électromécanique, Faculté des Sciences et de Technologie, Université de Ghardaia, Algérie
[2] Unité de Recherche Appliquée en Énergies Renouvelables, URAER, Centre de Développement des Énergies Renouvelables, CDER, 47133, Ghardaïa, Algeria

tahtah.reda@univ-ghardaia.edu.dz

Abstract. In order to enhance cooling systems and develop related industrial applications, focusing on the price of energy systems, an experimental investigation of airflow cooling around a cylinder was undertaken. The experiment was conducted on a mixed convection heat transfer device, where an aluminum cylinder was placed at the center of an ambient air cooling channel. At various cooling velocities (V = 0.28 m/s, 0.65 m/s, and 1.06 m/s), different imposed flows were obtained (Q = 20 W, 15 W, 10 W and 5 W). The outcomes demonstrate that the significance of air speed and cylinder exterior temperature. These observations underscore the significance of controlling operating conditions precisely to enhance the efficiency of heat transfer mechanisms. It is also important to develop innovative strategies to optimize heat transfer efficiency and ensure sustainable performance for thermal systems.

Keywords: cooling, mixed convection, horizontal aluminum cylinder, heat transfer, ambient air

Dft studies on electronic, opticalproperties of new half-heusler xrhz (x =v, nb and z = si, ge)

Bendehiba sid Ahmedi[1], Besbes Anissa[1] , Djelti Radouane[1] , Aissani Ali1[1] ,Benahmedi Lakhdar [1]

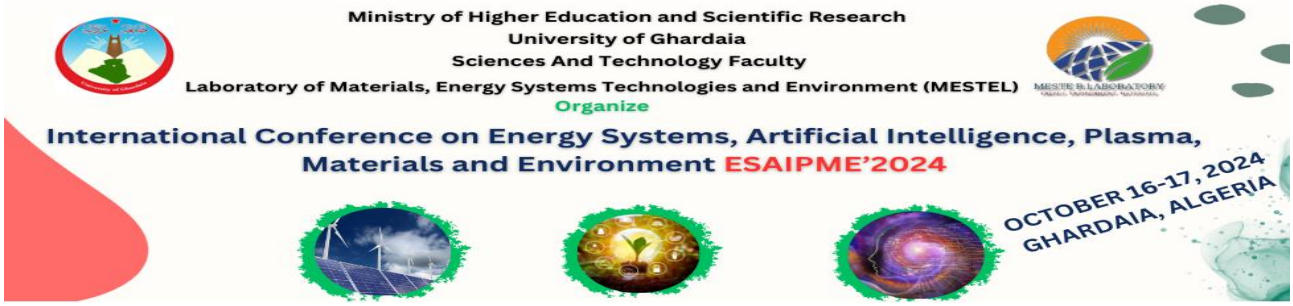
Laboratory of Technology and Properties of Solids, Abdelhamid Ibn Badis University, Mostaganem, Algeria

Sidro364@gmail.com

Abstract. In this study, density functional theory employing the TB-mBJ potential is employed to investigate the optical properties of new half-Heusler alloys XRhZ (X = V, Nb and Z = Si, Ge). The compounds are identified as nonmagnetic semiconductors with an indirect band gap. Structural and dynamical stability is confirmed through analysis of formation enthalpy, cohesive energy, and phonon band structures. Mechanical studies reveal these alloys (X = V, Nb; Z = Si, Ge) to possess stable, anisotropic properties with a ductile nature (B/G ratio > 1.75). Optical investigations highlight significant photocatalytic potential for NbRhSi and NbRhGe due to high absorption coefficients in the visible spectrum (~112.104 cm^{-1}). The study underscores the importance of optical characterization in ensuring the suitability of these semiconductor materials across varying frequencies, emphasizing the role of dielectric function (ω) in understanding their optical behavior.

Keywords: Half-Heusler alloys2. Optical properties3. Density functional theory (DFT)4. TB-mBJ potential5. semiconductors6. In direct band gap**.**

Experimental Investigation of Riblet Geometry for Drag Reduction on Multiform Bodies in Subsonic Flow



Faris Aissaoui[*,1,2], Yousef Belloufi[1,3], Amar Rouag[4,5], Abdelhafid Brima[1] , Abdelmoumene Hakim Benmachiche[6], Khalid faiza[7], faouzi Akermi[2]

[1] Laboratoire de Génie Mécanique, LGM, Université de Biskra, B.P.145 R.P. 07000 Biskra, Alegria.
[2] Université De Ghardaia, Faculté Des Sciences Et De La Technologie, Département D'automatique Et Electromécanique, Ghardia47000, Algeria.
[3]Univerité Kadi Merbah Ouargla, Faculté Des Hydrocarbures, Des Energies Renouvelables, Des Science De La Terre Et De L'univers, Département De Forage Et Mécanique Des Chantiers Pétroliers BP 511 Ouargla 30000, Algeria.
[4]Univerité Kadi Merbah Ouargla, Faculté Des Hydrocarbures, Des Energies Renouvelables, Des Science De La Terre Et De L'Univers, Département Des Energies Renouvelables, BP 511 Ouargla 30000, Algeria.
[5] Laboratoire De Génie Energétique Et Matériaux (LGEM), Université Mohamed Khider Biskra, B.P.145 R.P. 07000 Biskra, Alegria.
[6] Département de Physique, Université de Batna, Algria.
[7] Département de Mécanique, Université de Batna, Algria.

*: techno_fares@yahoo.fr

Abstract. This study investigates the effect of riblet geometry on drag reduction for various aerodynamic bodies in incompressible subsonic flow. Using a subsonic wind tunnel, drag forces were measured on three distinct smooth-walled shapes: a sphere, an ogive, and a wing, across a range of flow velocities. Riblets, known for their potential to reduce turbulent friction, were designed and applied to these bodies based on optimal geometric parameters derived from the experimental data. Our results indicate that riblets can achieve up to an 8% reduction in friction drag, with the wing-shaped body exhibiting the greatest improvement in aerodynamic efficiency. The findings suggest that riblet sizing and configuration play a critical role in enhancing performance, offering valuable applications in aviation and automotive design for energy savings and increased aerodynamic performance.

Keywords: Subsonic flow, wing, drag, sizing, riblets.

DSC and TGA Analysis of Thermal and Electrical Aging of HV 60 kV XLPE Insulation

A.Smaida[1], Y. Mecheri[1], S. Bouazabia[1,] L. Boukezzi[2]

[1]LSEI Laboratory, USTHB Algiers 16000, Algeria

smaida.abdelhay@yahoo.com

[2]Materials Science and Informatics Laboratory, MSIL, University of Djelfa Djelfa 17000, Algeria

Larbiboukezzi@gmail.com

Abstract. This paper is an attempt to evaluate thermal and thermogravimetric parameters of cross-linked polyethylene (XLPE) under thermal and electrical aging. Potential characterization techniques were used such as differential scanning calorimetry (DSC) and thermogravometric analysis (TGA).The induced degradation by both kinds of aging was determined by evaluating many physicochemical properties. DSC analysis was used to assess the induced modifications under both kinds of aging on the maximum melting temperature (T_m), the enthalpy of fusion ΔH_m, the lamellar thickness (L) and the crystallinity degree (χ).While the thermal stability of XLPE and its weight loss at high temperature was evaluated by TGA analysis. The obtained results showed that thermal and thermogravimetric properties are affected significantly by thermal aging than electrical one.

The effect of thermal aging is harmful especially at temperatures above the XLPE melting temperature. The main cause of this significant effect is the thermo-oxidative reactions affecting the amourphous and crystalline parts of the material. From the electrical aging results, one can admit that thermal and thermogravimetric properties of XLPE are less sensitive to electric field.

Keywords*:* XLPE, thermal aging, electrical aging, DSC, TGA, Crystallinity.

Heat transfer enhancement by electroconvection in a square Enclosure utilizing nanofluids

D.Akrour[1], W. Hassen[2] and K. Choukairy[3]

[1]*Theoretical and Applied Fluid Mechanics Laboratory, Faculty of Physics USTHB, Bab-Ezzouar Algeria*
[2] *National Engineering School, University of Monastir, Monastir 5000, Tunisia*
[3] National School of Applied Sciences, Moulay Slimane University, Khouribga, Morocco

dalila_akrour@yahoo.com

Abstract. A Numerical work was carried out to study the electrohydrodynamic (EHD) convective heat transfer in a differentially heated dielectric-MWCNT nanofluid layer. The study was conducted on a square enclosure subjected to a temperature gradient between these two vertical walls as well as a potential difference between these horizontal walls. The enclosure was filled with MWCNT oil-based nanofluid; the MWCNT nanoparticles were dispersed in a perfectly insulating thermal oil with a various volume fraction of nanofluid The governing equations were derived with the assumption of homogeneous nanofluid and were solved with employing finite volume method. Based on the obtained results, it was found that the increase of Rayleigh number, electric Rayleigh number and nanoparticle concentration enhanced the heat transfer. For high thermal and electric Rayleigh number values, the flow and heat transfer became time dependent and accordingly a frequency study was also performed. It was found that the inclusion of an electric field with the addition of nanoparticles led to a significant heat transfer enhancement of about 49%.
The abstract should summarize the contents and research findings in short terms, i.e. 200-300 words; justified between the margins and using the font/size specified below.

Keywords: nanoparticles, heat transfer , Dielectric-nanofluids; natural convection

Analysis of the influence of geometric and thermal parameters on the performance of a heating installation

Abdelhakem BELAGHIT[1, 2], Benaoumeur AOUR[2], Reda TAHTAH[1]

[1] University of Ghardaia, Algeria
[2] Laboratory of Applied Biomechanics and Biomaterials, National Polytechnic School, Maurice Audin of Oran 31000, Algeria

belaghithakim47@gmail.com

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Abstract. This work aims to model and size a floor heating system, using a solar collector to provide the necessary energy. The principle is to circulate water heated by a solar collector directly through a thermally insulated concrete slab with embedded tubes. A parametric study of the system studied made it possible to determine in dynamic mode the evolution of temperatures in the different elements constituting the system and to define the optimal characteristics of the installation.

Keywords: direct solar floor, solar energy, heat transfer, temperature, heat flow.

Dimensioning of an Air Solar Collector to Power a Heat Pump

AKERMI Faouzi [1,2], DIB Amar [2], AISSAOUI Faris[1], TOUAFEK Khaled [3]

[1.] Departement d'Automatique et Electromecanique, Université de Ghardaia, Agérie
[2.] Laboratoire de Physique du solide; université Badji-Mokhtar Annaba Algérie
[3.] Unité de Recherche Appliquée en Energies Renouvelables, URAER, Centre de Développement des Energies Renouvelables, CDER, 47133 Ghardaïa, Algeria.

aker_faouzi@yahoo.fr ; techno_fares@yahoo.fr ; Amar_dib2000@yahoo.fr
khaledtouafek@uraer.dz

Abstract. Our study consists of optimizing a heat pump using solar energy with an air collector. We used MATLAB to simulate and determine the optimal dimensions of the solar collector.

Heat pumps are presented as essential solutions to meet heating, cooling, and hot water production needs in an efficient and sustainable manner. By harnessing renewable energy sources, HPs help reduce our dependence on fossil fuels and limit greenhouse gas emissions.

This research focuses on improving the performance of a solar heat pump by identifying the optimal parameters of the solar collector integrated into the system. As part of a methodical approach, we analyzed the dimensions and characteristics of the solar collector to optimize the efficiency of the circuit.

The increase in the surface area of air solar collectors does not necessarily lead to a proportional increase in the mass flow rate of air, as shown by the results. It was concluded that the ideal dimensions for the solar collector are 1.5 m in length, 0.6 m in width, and 0.004 m in height. These dimensions allow for an optimal mass flow rate of air while maximizing the overall efficiency of the system.

Keywords: heat pump, renewable energy, solar collector, MATLAB, heating

An experimental study, energy and exergy analysis of solar stills

M.Azzaoui[1,2],A. Souigat[3], D. Slimani[3], Z. Korichi[3]

[1] Faculté des Sciences et Technologie,Université de Ghardaia,Ghardaia47000, Algeria
[2]Laboratoire des Materiaux, Technologie des Systemes Energetiques et Environnement
[3] Ecole Normale Supérieure de Ouargla, 30000 Ouargla, Algeria

Many regions of the world are affected by the shortage of drinking water and other necessary daily use. The Algerian desert is among the world's most fragile regions due to drought, water scarcity and climate variability. The city of Ouergla is located in the north of the Sahara desert in southern Algeria and contains sabkha and salty groundwater. Solar distillation technology is among processes used currently, which are considered promising technologies, have been used by researchers to rely on clean solar energy. Solar still was employed to purify the water but the amount of water produced from this system is very small. We conducted an experimental study on a single-slope solar distiller. Our results showed that productivity increases during the morning period, reaching a maximum value of about 0.48 L/m² at 3:00 PM. then it begins to decrease, until it reaches 0.14 L/m² by the end of the experiment. The cumulative productivity of the monoclinic solar still reached 2.79 L/m². The solar still demonstrates a daily efficiency of approximately 26 %.

Keywords: Solar still, Productivity, Daily efficiency, Exergy analysis

Novel Hybrid MRI/NIR Laser System for Non-Invasive Tissue Oxygenation Monitoring

Maha Algarawi [1,2], Hakan Erkol [1,4], Gultekin Gulsen [1,3], Farouk Nouizi [1,3,*]

[1] Center for Functional Onco-Imaging, Department of Radiological Sciences, University of California Irvine, CA 92697, USA
[2] Department of Physics, College of Science, Imam Mohammad Ibn Saud Islamic University (IMSIU), Riyadh 13318, Saudi Arabia
[3] Chao Family Comprehensive Cancer Center, University of California Irvine, CA 92697, USA
[4] Department of Physics, Bogazici University, Istanbul, Turkey

*fnouizi@uci.edu

Abstract. Diffuse optical tomography (DOT) enables the recovery of valuable bio-tissue physiological information but is limited by its poor spatial-resolution and quantitative accuracy, which hinders its clinical application. To address these challenges, our team developed Photo-Magnetic Imaging (PMI), a novel hybrid modality that combines optics with Magnetic Resonance Imaging (MRI). PMI leverages near-infrared laser illumination to induce a temperature increase in the tissue, which is then measured using Magnetic Resonance Thermometry (MRT). From the resulting MRT maps, optical absorption at the laser's wavelength can be reconstructed using a dedicated PMI algorithm. Here, we present a validation study of the multi-wavelength PMI modality, employing five laser wavelengths (760–980 nm). PMI successfully recovered high-resolution, wavelength-specific absorption maps, accurately quantifying the concentrations of the main absorbers in the tissue. By delivering high-resolution functional information, PMI demonstrates significant potential for applications in tissue physiology assessment, cancer detection, and treatment monitoring.

Key words: Magnetic Resonance Imaging, Diffuse Optical Tomography, Near-infrared Lasers, Photothermal Imaging.

Numerical study of melting mode in Selective Laser melting process

O. Hadj Rahmoun, T. Tamsaout, K. Kheloufi , E. H. Amara

[1] Princeton University, Princeton NJ 08544, USA
Laser Material Processing Team,
Centre for Development of Advanced Technologies, CDTA, PO. Box 17 Baba-Hassen, 16303 Algiers, Algeria

Ohadjrahmoune@cdta.dz

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Abstract. Selective Laser Melting (SLM) is the most recommended Additive manufacturing (AM) process to overcome the problems of conventional manufacturing as making parts with 3D complex geometries. However, several challenges limit this application such as porosity, low resolution and low surface finish quality. To face these challenges, it is essential to have a good understanding and mastery of the fundamental physical phenomena involved in the selective laser powder bed fusion process. Therefore, multiphysics simulations of metal additive manufacturing processes have so far proven their capability as a reliable tool to understand and predict the behaviour of the phenomena governing the LPBF process. In this work, a mesoscale computational fluid dynamics (CFD) model to model a single-track is developed using OpenFOAM framework combined with DEM method to generate the powder bed. In which, surface tension, Marangoni convection and recoil pressure driven flows at the free surface, and other physical phenomena affecting the process have all been examined. We investigate different melting modes using various scanning velocities. For the small velocities, the keyhole mode of melting occurs where both the thermos-capillary force and recoil pressure play a dominant role. On the other hand, for the high velocities, the conduction mode occurs where the thermos-capillary force as the major driving force results.

Keywords: Additivemanufacturing, Numerical simulation, laser powder bed fusion (LPBF), Ray tracing, Selective laser melting (SLM).

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Artificial Intelligence in Energy and Renewable Energies Systems and industry

Study of the thermodynamic properties of metal hydrides by the data mining method: Application for hydrogen storage

Djellouli Abdelkader [1] , Kamel Benyelloul [2], *Aze Eddine Adjaj [3]
[1] University of Tiaret
[2]Applied Research Unit in Renewable Energies, URAER, Renewable Energy Development Center, CDER, 47133, Ghardaïa, Algeria
[3]University of Ain Temouchent

Abstract. In this article, principal component analysis (PCA), a powerful data analysis technique, was applied to streamline the exploration of transition metal combinations for potential hydrogen storage applications. By employing PCA, we were able to select, classify, and identify numerous combinations of transition elements A and B,(B = Zr, Ti, Y, Sc, La, Hf, Th). This analytical approach allowed us to reduce the complexity of the data, focusing on key atomic properties that influence the formation and stability of binary alloys.
The PCA results led to the identification of 76 potential combinations of transition metals. These combinations were found to be strongly influenced by the atomic characteristics of element A, such as its Pauling electronegativity, atomic radius, and atomic electron density. These properties play a crucial role in determining how the elements interact with each other, which in turn impacts the formation energy and stability of the resulting alloys.

Out of the 76 combinations, 55 systems were grouped together based on their similarities in structural and electronic properties. Furthermore, 46 of these combinations exhibited a negative enthalpy of formation, indicating that these alloys are thermodynamically stable and capable of forming spontaneously. Among these, 18 binary alloys showed particular promise for hydrogen storage, as they possessed favorable thermodynamic and structural properties that make them suitable for reversible hydrogen absorption and release, a key criterion for efficient energy storage applications.

Keywords: Data mining method, principal component analysis, Pauling's electronegativity, atomic electron density, atomic radius, formation enthalpy, metallic hydrides, hydrogen storage.

Particle swarm optimization to extract the temperature-dependent capacitance-voltage characteristics of NiO/Ga2O3 heterojunction diode

Yasmine Senouci[1], Nouredine Sengouga[1] and Elyes Guaroudja[2]

[1] Laboratory of Metallic and Semiconducting Materials (LMSM), University of Biskra, Algeria
[2] Plateforme Technologique en Micro-fabrication, Centre de Développement des Technologies Avancées

yasmine.senouci@univ-biskra.dz

Abstract. The experimental capacitance-voltage (C-V) characteristics of a NiO/Ga_2O_3 heterojunction diode (HJD) were accurately modeled using particle swarm optimization (PSO), allowing for the extraction of the voltage barrier (V_B) and effective doping density (N_{eff}). This PSO-based modelling was compared with the classical analytical method (CAM). The error between the modelled and measured capacitances from both methods (PSO and CAM) was then evaluated and compared.

Keywords: capacitance voltage characteristics, NiO/Ga2O3 heterojunction, Modelling, PSO.

Comparative Analysis of Machine Learning Models for Material Property Prediction

Saad Boudabia[1,2], Youcef Mahdjoub[1,2], Ahmed Draoui [3,4] , Fatima Zohra Bensalem[1], and Kheira Laiourate[1]

[1]Dept. of Mathematics and Computer Science, University of Ghardaia, Algeria
[2] Lab. des Mathématiques et Sciences Appliquées (LMSA)
[3]Laboratoire de physique des mate riaux, Universite Amar Telidji de Laghouat, BP 37G, 03000
[4]Lab. de Physique des Matériaux (LPM), Laghouat, Algeria. – Algeria

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Abstract. Materials scientists have unlocked a revolutionary approach by combining the power of deep learning with traditional methods. This allows them to predict material properties with exceptional precision, using the periodic table as a guiding principle. Focusing on the link between chemical composition and material behavior, researchers developed hybrid models. These models leverage cutting-edge deep learning architectures (Convolutional Neural Network CNNs, Long Short Term Memory LSTM) alongside traditional machine learning models (Extreme Gradient Boosting XGBOOST, Support Vector Machine SVM and Random Forests RF) by training on the vast data within the Open Quantum Materials Database (OQMD). The resulting model offers an impressive 98% accuracy and minimal prediction error compared to Density Functional Theory (DFT) calculations. This innovative approach not only provides highly accurate predictions, but also leverages the structural knowledge intrinsic to the periodic table, paving the way for a robust framework for predicting material properties. This breakthrough represents a significant advance in materials science, opening the door to more efficient materials design and the development of sustainable energy technologies.

Keywords: Convolutional neural networks (CNNs), Long Short Term Memory (LSTM) , Support Vector Machines (SVM), Random Forests (RF), Extreme Gradient Boosting (XGBOOST), Material properties, OQMD dataset, Density functional theory (DFT), Energy efficiency.

Evaluation of takagi-sugeno fuzzyinference for estimating evapotranspiration in mila-algeria's sub- humid climate

Assia Meziani [1] , Abdelmonen Miloudi [2] , and Mohammed Sayah Lembarek [3]

[1,2,3] Department of Hydraulic and Civil Engineering, New Technology and local Development Laboratory, Faculty of Technology, University of El-Oued, BP 789, El-Oued, Algeria.

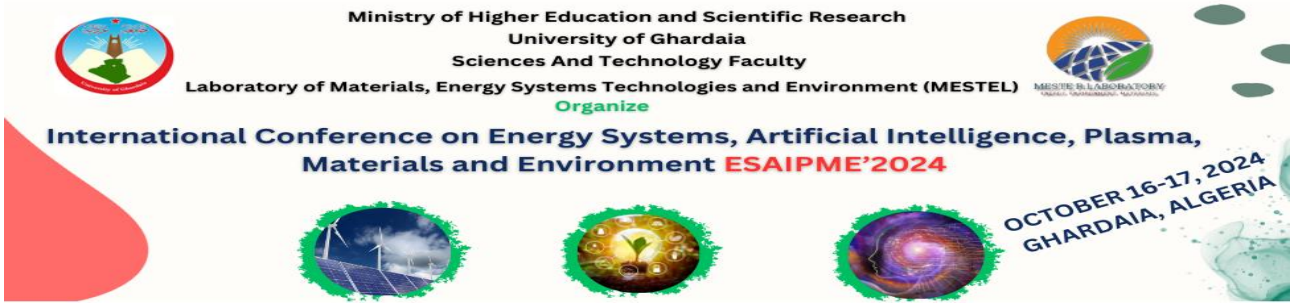
assia-meziani@univ-eloued.dz

Abstract. Effective water resource management is crucial for sustaining agricultural productivity, particularly in regions prone to water scarcity. The FAO-56 method, developed by the Food and Agriculture Organization, hasbecome a cornerstone for accurately estimating reference evapotranspiration (ET_0), a key component in understanding water requirements for crops. The FAO-56 method integrates key meteorological data—temperature, humidity, wind speed, solar radiation, and other climatic parameters to provide accurate and consistent ET estimates, which are crucial for effective water resource management in agriculture. To enhance ET estimation in the sub-humid region of Mila, Algeria, a Takagi-Sugeno (TS) fuzzy inference system model was developed. The TSFS model demonstrated strong performance with low RMSE (0.417-0.434), high R^2 (0.945-0.950), and a high Willmott index (0.827-0.831), indicating reliable and accurate ET predictions for the Mila region. These results suggest that the Takagi-Sugeno fuzzy inference system is a viable alternative to traditional methods, offering robust ET estimates tailored to the specific climatic conditions of Mila, Algeria.

Keywords: Evapotranspiration, FAO-56, Takagi-Sugeno Fuzzy System, Model, Sub-humid, Mila, Algeria

Enhancing fault tolerance performance of PV system under partially shaded conditions using an Inc-Cond-IT-2FLC hybrid controller

Rania Benyoucef[1], Meriem Benbrahim[1] and Samir Abdelhamid[1]



[1] Department of Industrial Engineering, Laboratory of automation and Manufacturing Engineering LAP, University of Batna 2, P.O. Box: 05000, Batna, Algeria

r.benyoucef@univ-batna2.dz

Abstract. This paper proposes the use of a hybrid controller that links Incremental Conductance (Inc-Cond) and Interval Type-2 Fuzzy Logic (IT-2FL) methods to reduce limitations of power tracking in the case of partial shading. It employs an Interleaved Boost Converter (IBC) synchronized with the pulses generated by the MPPT to maintain the PV system operating near its Global Maximum Power Point (GMPP). Integrating IT-2FL improves the tracker's search process by employing rules fuzzification and handling uncertainties amidst significant fluctuations in weather conditions. Through MATLAB simulations, the suggested controller achieves accurate and rapid convergence to GMPP, exceeding the single-use performance of Inc-Cond technique across a variety of operational circumstances and PV generator configurations, MPP value, efficiency and other factors.

Keywords: Pv system, Partial shading, Hybrid controller, Inc-Cond, IT-2FLC.

Deep Learning-Based Modeling of Mechanical Properties in Poly(ethylene adipate) Thin Films Incorporated with Zinc Oxide Nanoparticle

Zoulikha Hafsi [12,] Yasmina Khane [12] Fares Fenniche [12] Djaber Aouf[1]

[1]Faculty of science and technology, University of Ghardaia, BP455, 47000, Ghardaia, Algeria. [1]

[2] Materials, Energy Systems Technology and Environment Laboratory, University of Ghardaia, BP455, 47000, Ghardaia, Algeria.

hafsidoc@yahoo.com

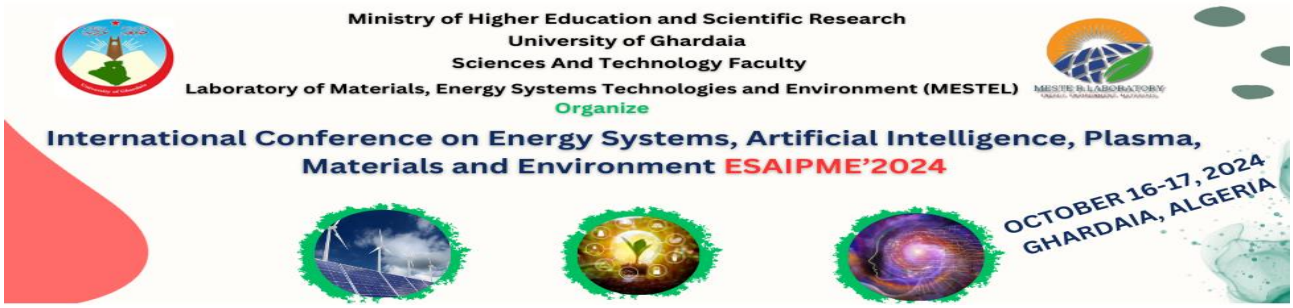
Abstract. This study investigates the mechanical properties of poly(ethylene adipate) (PEA) thin films incorporated with varying concentrations of Zinc Oxide (ZnO) nanoparticles, leveraging Deep Neural Networks (DNNs) for predictive modeling. Our results reveal that the incorporation of 1% ZnO enhanced the tensile strength and Young's modulus, while higher concentrations showed a marginal decrease in elongation at break. The DNN model predicted these mechanical properties with a high level of accuracy, effectively capturing the nuances of mechanical property variations due to changes in ZnO content. This research not only confirms the potential of ZnO nanoparticles to improve film characteristics but also showcases the efficiency of DNNs in material science, particularly in predicting and optimizing the mechanical properties of polymer nanocomposites.

Keywords: Deep Learning, Poly(ethylene adipate), Zinc Oxide Nanoparticles, Composite Thin Films, Mechanical Properties, Predictive Modeling

Investigation of mechanical properties of synthesis aliphatic polyester/ layered silicate

Yasmina Khane [* 1, 2] , Zoulikha Hafsi[2 ,1] , Fares Fenniche [1, 2] , Djaber Aouf [1, 2] , Bouras Hadj Daouad[1], Mansouri khaled [1], Sofiane khane[1]

[1] Faculty of Sciences and Technology, University of Ghardaïa, BP 455, 47000 Ghardaïa, Algeria
[2] Materials, Energy Systems Technology and Environment Laboratory, Faculty of Sciences and Technology, University of Ghardaïa, BP 455, 47000 Ghardaïa, Algeria
[3]Laboratoire de Valorisation et Conservation des Écosystèmes Arides (LVCEA), Faculté des Sciences de la Nature et de la Vie etSciences de la Terre, Université de Ghardaia, Ghardaia, Algeria
[4] Faculty of Sciences , University of Djillali Liabes, Sidi Bel Abbes, Algeria
Yasminaekhane@yahoo.fr



Abstract. Aliphatic polyesters, renowned for their high biocompatibility, represent a crucial class of synthetic biomaterials. This study investigates the synthesis and characterization of biodegradable poly(ethylene adipate) (PEAd) and its nanocomposites. PEAd with free hydroxyl groups was synthesized via direct polyesterification of adipic acid and ethylene glycol. The molecular weight (Mw) of the resultant copolymers was found to be dependent on the alkylene chain lengths of the constituent diacids and diols. Fourier-Transform Infrared Spectroscopy (FTIR) and Proton Nuclear Magnetic Resonance (1H NMR) were employed to confirm the structure of the synthesized polyesters. Subsequently, PEAd/layered silicate nanocomposites were fabricated through melt extrusion of PEAd and organically modified montmorillonite (C18-mmt) at 150 ◦C. The structural and morphological characteristics of the modified montmorillonite and the nanocomposites were elucidated using FTIR and Scanning Electron Microscopy (SEM). SEM analysis revealed the presence of randomly oriented, stacked silicate layers dispersed within the PEAd matrix. Notably, these nanocomposites exhibited significant enhancements in mechanical properties in both solid and melt states compared to the pristine PEAd matrix. This research contributes to the development of biodegradable materials with improved mechanical properties, potentially expanding their applicability in various fields.

Keywords:poly(ethylene adipate), montmorillonite, nanocomposites, mechanical Properties.

Improved power generation based on deformation of lead zirconate titanate (PZT) piezoelectric ceramics for energy harvesting applications with renewable energy.

HADJADJ SADOK

Ouargla University

Abstract. Researchers are currently increasingly interested in generating electrical energy to cover the increasing demand of energy consumption thanks to piezoelectric converter technology. Accordingly, this study is based on different piezoelectric materials (ceramics) to better understand their properties under the influence of mechanical stress or vibration and electric field during energy harvesting using converter devices.Recently, the demand for inventions related to renewable and clean energy has increased to reduce pollution levels. Power generation using vibration based on piezoelectric materials is a very promising field. The power generated by piezoelectric materials at the micro to milliwatt level is very suitable for charging and powering portable devices, operating low-power sensors, etc.
In this study, solid solutions of piezoelectric and dielectric ceramics: Pb1- (x + y) Lax Ndy [(Zr 0,524 Ti 0,476) 1-(5w + 3z)/4 Nbw] O3 + z % wt Cr2O3 abbreviated PLNZCNT were prepared by conventional solid state reaction methodwhere z = 0, 0.5, 0.75, 1, 1.25, 1.5 and 2 mol%. Using different techniques such as X-ray diffraction (XRD) which reveals the phase of the samples forming the mixture (morpho-tropic phase boundaries MPB). Scanning electron microscopy (SEM) which shows the grain size, dielectric measurements were performed to understand the effect of Cr content on the properties of PLNZCNT ceramics. Ceramics sintered at 1200 °C with Cr = 0.75 mol% were found to achieve excellent dielectric properties (εr = 24137. 608 , tan δTc = 0.07255 and Tc = 651 K).

Keywords: PZT, PLNZCNT, Piezoelectric, Dielectric loss, renewable energy.

Photocatalytic Degradation of Methylene Blue Using Zinc Sulfide-Based Thin Films Prepared by Spin Coating

Djaber Aouf [1], Derbali Imane[1]

[1] Faculty of Science and Technology, University of Ghardaia, BP455, 47000, Ghardaia, Algeria,

Abstract. This study investigates the fabrication of ZnS/PbS thin films on glass substrates via the spin coating technique, employed for the adsorption of methylene blue (MB) under visible light irradiation from aqueous solutions in a batch adsorption setting. The structural characteristics of the ZnS/PbS films were assessed using X-ray diffraction (XRD), confirming the successful synthesis of the composite. Surface morphology and composition were analyzed using energy-dispersive X-ray spectroscopy (XPS). The influence of various factors, including contact time, initial concentration, pH, and temperature on the adsorption of methylene blue, was thoroughly examined. The kinetics of the degradation process were analyzed using the Langmuir-Hinshelwood kinetic model. The findings revealed an impressive photodegradation efficiency, achieving nearly 95% dye removal from the solution after 90 minutes of UV exposure at 138 W.

Keywords: ZnS/PbS, spin coating, photocatalytic, thin film, methylene blue

Electrochemical Nanocomposite Sensor for Sensitive Detection of Lead Concentrations

Fares Fenniche∗[1,2], Fatima Zohra Nouasria∗[3], Dhiya Elhak Djafri[4], Yasmina Khane[5,6], and Djaber Aouf[6]

[1]Materials, Energy Systems Technology and Environment Laboratory, University of Ghardaia – Algeria
[2]Department of Process Engineering, Faculty of Sciences and Technology, University of Gharda¨ıa, BP 455, 47000 Gharda¨ıa, Algeria – Algeria
[3]Process Engineering Laboratory (PEL), Kasdi Merbah University, 30000 Ouargla, Algeria – Algeria
[4]Laboratory of Dynamic Interactions and Reactivity of Systems, University of Kasdi Merbah, 30000, Ouargla, Algeria – Algeria
[5]Materials, Energy Systems Technology and Environment Laboratory, University of Ghardaia – Algeria
[6]Faculty of Science and Technology, University of Ghardaia, BP455 47000, Ghardaia, Algeria – Algeria

Abstract. The current era has witnessed a significant surge in the development and application of sensors, driven by their critical importance to researchers and scientists. This surge is fueled by advancements that enhance sensor sensitivity and the availability of cost-effective materials that offer alternatives to more expensive devices. In this study, we explored the electrochemical synthesis of nanocomposites, specifically focusing on nanostructured polyaniline(PANI) nanorods (NRs) integrated with reduced graphene oxide (rGO) and zinc oxide(ZnO). These nanocomposites were synthesized simultaneously within a single cell on indiumtin oxide (ITO) substrates, aiming to detect varying concentrations of heavy metals. ThePANI-rGO/ZnO nanocomposite was formed by embedding rGO into PANI thin films duringthe electrochemical polymerization process in the presence of sulfuric acid. The electrochemical analysis of the resultant sensor exhibited a notable sensitivity in detecting lead ions atextremely low molar concentrations.

Keywords: Polyaniline (PANI), Reduced Graphene Oxide (rGO), Nanocomposite Sensors, Lead

Detection, Thin Film Electrodes, Electrochemical Synthesis High sensitivity microwave sensor based on meta-materials for the characterization of liquid media

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GHARDAIA, ALGERIA

[1] Univercitty of Ghardaia
[2] Institut für scienses and technologie
Departement of automatic and electromechanic

Abstract. This Work introduces a compact and highly sensitive microwave sensor based on a metamaterial CSRR for liquid characterization at microwave frequencies. The design employs a two-port microstrip-fed patch structure on a 20 × 28 mm² Roger RO3035 substrate (εr = 3.5, thickness = 0.75 mm, loss tangent = 0.0015), with a CSRR etched on the ground plane to reduce size. A liquid sample in a capillary tube is placed parallel to the sensor, enhancing sensitivity and Q factor. A bent structure further improves sensitivity, achieving a 10-fold increase compared to the flat design. Simulations (CST, HFSS) and experiments validated the results, showing good agreement. The design allows for rapid, cost-effective liquid sensing, ideal for various applications..

Keywords: microwave sensor, meta-materials, liquid,

Accelerating Perovskite Discovery with Machine Learning: XGBoost Application on Open Quantum Materials Database

Soundous Touati[1,2*], Ali Benghia[1], Zoulikha Hebboul[3]

[1]Laboratoire de physique des mate´riaux, Universite´ Amar Telidji de Laghouat, BP 37G, 03000 Laghouat, Algeria
[2]Laboratory of Applied Sciences and Didactic, Higher Normal School of Laghouat, 03000 Laghouat, Algeria.
[3]Laboratoire Physico-Chimie des Mate´riaux (LPCM), Universite´ Amar Telidji de Laghouat, BP 37G, Route de Ghardaia, 03000 Laghouat, Algeria

[*]s.touati@lagh-univ.dz

Abstract. Recently, there has been significant interest in perovskites owing to their diverse applications and impressive efficiency. However, advancement in this area has faced obstacles due to the high costs of experimentation and the time-intensive nature of Density Functional Theory (DFT) calculations. This study introduces a novel application of the XGBoost regression algorithm with 1786 cubic oxides using the open quantum materials database (OQMD) to expedite the identification and analysis of perovskites, leveraging extensive datasets generated through DFT computations. We employed XGBoost for regression to extract insights from our dataset, enabling accurate predictions of lattice constant (achieving a remarkable accuracy of 98.55%, root mean square error (RMSE) of 0.029 Å, and mean absolute error (MAE) of 0.014 Å), formation energy (with optimal accuracy reaching 98.31%, RMSE of 0.009 eV/atom, MAE of 0.059 eV/atom), and band gap energy (achieving an optimal accuracy of 89.43%, RMSE of 0.062 eV, MAE of 0.154 eV). Through these models, machine learning accelerates the exploration of new perovskite materials and significantly reduces the associated costs with enhanced overall performance.

Keywords: Perovskites; XGBoost algorithm; lattice constant; formation energy; band gap energy.

The synthese of(methoxycarbonymethyl) triphenylphosphonium bromide and his oxydes

Derbali Imane[1], Djaber Aouf [1]

Ministry of Higher Education and Scientific Research
University of Ghardaia
Sciences And Technology Faculty
Laboratory of Materials, Energy Systems Technologies and Environment (MESTEL)
Organize
International Conference on Energy Systems, Artificial Intelligence, Plasma, Materials and Environment ESAIPME'2024
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[1] Faculty of Science and Technology, University of Ghardaia, BP455, 47000, Ghardaia, Algeria,

Abstract. A phosphonium salt is a salt containing the phosphonium ion (PH_4^+), such as phosphonium iodide ($PH_4^+I^-$). More commonly, the term refers to a quaternary organic derivative such as tétraphénylphosphonium chloride $(C_6H_5)_4P^+ Cl^-$, or tétraméhylphosphonium iodide $([P(CH_3)_4]^+I^-)$.

Our work is focused on:

• Preparation of (Methoxycarbonylmethyl) triphénylphosphonium bromide.

• Preparation of (Methoxycarbonylmethyl) triphénylphosphonium bromide oxide.

• Preparation of (Methoxycarbonylmethyl) triphénylphosphonium chloride oxide.

In this study, different methods were adopted to carry out our synthesis:

- ❖ The different unit operations.
- ❖ Different tools and methods to confirm more and more the reliability of the results obtained.

Keywords: phosphonium salt, triphénylphosphonium, unit operations.

Intelligent fault diagnosis of PV systems based on Random Forest classifier

Cherifa KARA MOSTEFA KHEIL [1,2*], Merouane BERCHOU[1] and Ahmed BOUDJADI[1]

[1]*Technology Department, Khemis Miliana University, Algeria,
[2] Electronics Department, SET Laboratory, Blida 1University

k.karamostapha@univ-dbkm.dz
karamostefa_cherifa@univ-blida.dz

Abstract. In recent years, most researchers around the world talk about energy transition from fossil to renewable energy particularly photovoltaic (PV) energy that are becoming more and more popular. For the speedy development and installation of PV systems in the Globe, people in this field are carefully discussing and studying the kinds of faults and failures that these types of systems may encounter. For this, fault diagnosis and evaluation of PV systems have become the most crucial topic in the aim to amplify performance and system efficiency, reduce maintenance costs as well as repair times. In this paper, a random forest classifier is proposed to diagnose short circuit and open circuit faults of PV systems. The random forest classifier is trained using machine learning algorithms to classify different types of faults in the PV system requiring real measured data issued from an experimental PV setup that include weather conditions citing cell temperature and solar irradiation, system parameters such as current as well as voltage at Maximum power point, and performance metrics. The random forest classifier can be used as a tool for proactive maintenance and fault diagnosis in PV systems, leading to improved system performance and reliability. The proposed approach is tested on global real data from a PV system and shows promising results in accurately diagnosing faults in the PV system with a precision of 100% for current classification and 99% for voltage classification in few seconds response time for each of the two parameters current and voltage.

Keywords: PV setup, faults, isolation, diagnosis, Random Forest classifier.

Performance evaluation of a single user receiver in the DS-OCDMA system.

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GHARDAIA, ALGERIA

Biteur kada [1*], Benadda Lotfi [2]
1Department of Automatic and Electromechanical, Faculty of Science and Technology, Ghardaia University, Algeria .
2Research Laboratory No. 60: Valorization of Water Resources, Tlemcen University, Algeria.

biteur.kada@univ-ghardaia.dz

Abstract. The CDMA (Code Division Multiple Access) technique, widely used in radio frequency (4G) applications [1], is gaining increasing attention for its potential to leverage the bandwidth offered by optical fiber. As a result, CDMA presents itself as a promising solution for future optical access networks. This paper provides an exploratory study on applying direct sequence CDMA to optical transmission systems. It evaluates the performance of optical orthogonal coding (OOC) with a conventional receiver model, both with and without an optical limiter (CR and CR-OL, respectively), considering the impact of multiple access interference (MAI). Multiple simulations were performed to analyze the bit error rate (BER) as it relates to the detection threshold for the Conventional Receiver with an Optical Limiter (CR-OL), considering both conditions with and without the influence of additive white Gaussian noise (AWGN). The results from these simulations were generated using MATLAB software.

Keywords: Optical transmission, optical CDMA, Orthogonal Optical Codes (OOC), Conventional Receiver (RC), Optical Limiter, Multiple Access Interference (IAM), additive Gaussian noise (AWGN))

Hybrid Photovoltaic-Battery energy Systems with Fuzzy Logic Control of Three-Level NPC inverter

Ahmed Bahri [1*], Nabil Mezhoud[2], Mohcene Bechouat[3], Bilel Ayachi[4]and Thameur Abdelkrim[5]

[1] Materials, Energy Systems Technology and Environment Laboratory Faculté des sciences et de la technologie Université de Ghardaia, Algeria
[2]Electrical Engineering Department, LES Laboratory, Faculty of Technology, University of 20 August 1955-Skikda, Algeria.
[3]Department of Automatics and Electromechanics. Laboratoire des télécommunications, Université 8 Mai 1945 Université de Ghardaia, Algeria
[2]Electrical Engineering Department, LES Laboratory, Faculty of Technology, University of 20 August 1955-Skikda, Algeria.
[4] Unité de Recherche Appliquée en Energies Renouvelables, URAER, Centre de Développement des Energies Renouvelables, CDER, Ghardaïa 47133, Algeria

[*] bahri.ahmed@univ-ghardaia.dz

Abstract. The hybrid system consists of several essential components. Firstly, a photovoltaic (PV) panel converts sunlight into electrical energy, connected to a battery energy storage (BES) that serves as a crucial energy reservoir. This battery stores excess energy from the PV panel for use during periods of low sunlight or high demand. The hybrid system's output is then directed to a variable load, representing electrical devices or systems consuming power. This load varies in power requirements over time, requiring a flexible and efficient energy delivery mechanism. Additionally, the hybrid system features a DC link with a proportional-integral-derivative (PID) controller, crucial for maintaining voltage regulation and stability in the system's DC circuitry. The PID controller optimizes performance by adjusting control parameters based on operating conditions, mitigating voltage fluctuations. To manage power flow and ensure optimal performance, a three-level inverter is employed. This inverter converts electrical energy between different voltage levels, ensuring compatibility between PV/BES output and the variable load. The three-level inverter, Type NPC, is controlled using fuzzy logic. One specific objective of fuzzy logic control in this context is to reduce Total Harmonic Distortion (THD) in the system

Keywords: Photovoltaic (PV), Battery energy storage, Proportional-Integral-Derivative (PID), A three level NPC inverter, Fuzzy Logic Controller (FLC).

Python-framework for Mobile Robot Competition

Volodymyr Kopei[1], Oleh Onysko[2], Abderrahmane Bellaouar[3], Vitalii Panchuk[4], Cristian Barz[5], Ihor Proniuk[6]

[1,2,4,6]Department of Computerized Mechanical Engineering, Ivano-Frankivsk National Technical University of Oil and Gas, Karpatska str., no. 15, Ivano-Frankivsk 76019, Ukraine
1vkopey@gmail.com***, 2***onysko.oleg@gmail.com, ***4***V_PANCH@ukr.net, 6pronyuk00@gmail.com
3 MESTEL Laboratory, University of Ghardaia, Scientific Zone, BP 455, Ghardaia 47000, Algeria
3ar.bellaouar@univ-ghardaia.dz
5Technical University of Cluj Napoca, CUNBM, Baia Mare, Romania

5cristian.barz@ieec.utcluj.ro

Abstract. The organization of robot competitions, as a rule, is complicated by the problem of the high cost of components, which limits the number of potential participants. To solve this problem, a simple mobile robot competition software framework based on Arduino, Firmata and Python has been developed. The framework allows you to create and run Python applications on a PC for controlling mobile robots that, using the Firmata protocol, remotely exchange data with StandardFirmata sketches running on inexpensive microcontrollers of robots. This approach allows you to use any Python packages in control programs and does not require re-flashing of microcontrollers. Mobile robots with low-cost components such as Arduino Uno, ultrasonic sensor HC-SR04 and Bluetooth module HC-05 can take part in the competition. The competition consists in the fact that the robots of the participants must automatically identify a certain object and push it out of the circle. The robot that does this gets one point. If he pushes another object, then points are deducted. Several levels of competition difficulty are offered. At simple levels, the control programs of the participants receive shared auxiliary information about the location of the robots, which is formed using the camera and OpenCV algorithms. At complex levels, control programs are completely autonomous. With the help of Pymunk and Nodebox for OpenGL, a robot competition simulation environment has also been developed, which can be used by participants to debug their robot control algorithms, in particular for reinforcement machine learning.

Keywords**:** Mobile Robot, Machine Learning, System Identification, Programmable Control, Simulation

Classification of information resources of PLM systems based on the principles of systems theory and machine learning methods

Volodymyr Kopei[1], Oleh Onysko[2], Abderrahmane Bellaouar[3], Vitalii Panchuk[4], Cristian Barz[5]

[1,2,4] Department of Computerized Mechanical Engineering, Ivano-Frankivsk National Technical University of Oil and Gas, Karpatska str., no. 15, Ivano-Frankivsk 76019, Ukraine
[1]*vkopey@gmail.com*, [2]oleh.onysko@nung.edu.ua, [4]v_panch@ukr.net
[3] MESTEL Laboratory, University of Ghardaia, Scientific Zone, BP 455, Ghardaia 47000, Algeria
[3]ar.bellaouar@univ-ghardaia.dz
[5] Technical University of Cluj Napoca, CUNBM, Baia Mare, Romania

[5]cristian.barz@ieec.utcluj.ro

Abstract. Information support of the product life cycle involves the use of a system of heterogeneous information resources (PLM system). These resources are designed to solve problems that arise at different stages of the life cycle and are able to exchange information with each other to achieve an emergent effect. In complex PLM systems, the set of information resources is very diverse, so there is a problem of their classification and classification of their relationships, primarily binary. The class of the information resource allows you to identify its scope of application in the PLM system or the stage of the life cycle. The relation class allows you to identify synergistic or dissynergistic relations. Effective classification methods will improve the targeted use of information resources and their integration into an effective system with the maximum level of synergy. Using examples of PLM information resources and using the principles of general systems theory and machine learning methods, the methods of feature selection and classification of information resources are shown. Among them are such resources as knowledge bases on product quality issues, conceptual modeling tools, CAD tools, mathematical and finite element models, CAM tools, production SCADA systems, operational monitoring systems, failure databases and other. In particular, such system-wide dichotomy features as "projects"-"implementation", "initiation"-"completion", "processes"-"goals", "concepts"-"technologies", "heuristic"-"formalized" were used and other. The results show that systems theory principles and modern machine learning methods can effectively classify the information resources of such complex information systems as the PLM system.

Keywords: Information System, Product Life Cycle, Synergy, Features, Dichotomy, Isomorphism Principle.

Energetic efficiency enhanced and environment indicator optimization of hybrid microgrids enriched by renewables energies sources using swarms intelligence algorithm and nature-inspired methods

Nabil MEZHOUD [1], Ahmed BAHRI [2], Bilel AYACHI [1]and Farouk BOUKHENOUFA [1]

1 Electrical Engineering Department, Faculty of Technology, LES Laboratory, University 20 Août 1955-Skikda, Algeria
2 Department of Automatics and Electromechanics, MESTE Laboratory, Ghardaïa University, Algeria

n.mezhoud@univ-skikda.dz

Abstract. Widespread adoption of renewable energy in microgrids (MGs) saves customers from high fuel prices and provides a sustainable replacement for future fossil fuel depletion. In order to realize the full operating benefits of MGs, such as improved profitability, reduced dependency on the main grid and enhancing energy efficiency, it is important to integrate renewable distributed generation (RDGs) into MGs. These MGs, in turn, represent the heart of smart distribution networks in modern electricity systems. Also, the use of RDGs in MGs not only provides clean and green energy but also reduces the gigantic of actives losses in transmission and distribution lines. In this work, one of the most general bio-inspired methods called whale optimization algorithm (WOA) and one of swarm intelligence methods called particle swarm optimization (PSO) are applied to solve multi-purpose problems of hybrid MG operated by renewable energy sources (RES). The WOA and PSO approaches have been investigated and tested to solve the the optimal energy management (OEM) and environmental indicator (EI) problems of a hybrid MG composed of different types of renewable and non-renewable DG units, such as wind turbines (WT), photovoltaic (PV), fuel cells (FC), micro-turbines (MT) and the diesel electric generator (DEG) with an energy storage system (ESS). Compared with recently published results, the results obtained are promising and demonstrate the effectiveness

Keywords: Environmental indicator, Optimal energy management , Energetic efficiency, Microgrid s, Renewable energies sources , Swarm intelligence, Nature- inspired methods

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Intelligent fault diagnosis of PV systems based on Random Forest classifier

Cherifa KARA MOSTEFA KHEIL [1,2*], Merouane BERCHOU[1] and Ahmed BOUDJADI[1]

[1*]Technology Department, Khemis Miliana University, Algeria
[2] Electronics Department, SET Laboratory, Blida 1University,

k.karamostapha@univ-dbkm.dz
karamostefa_cherifa@univ-blida.dz

Abstract. In recent years, most researchers around the world talk about energy transition from fossil to renewable energy particularly photovoltaic (PV) energy that are becoming more and more popular. For the speedy development and installation of PV systems in the Globe, people in this field are carefully discussing and studying the kinds of faults and failures that these types of systems may encounter. For this, fault diagnosis and evaluation of PV systems have become the most crucial topic in the aim to amplify performance and system efficiency, reduce maintenance costs as well as repair times. In this paper, a random forest classifier is proposed to diagnose short circuit and open circuit faults of PV systems. The random forest classifier is trained using machine learning algorithms to classify different types of faults in the PV system requiring real measured data issued from an experimental PV setup that include weather conditions citing cell temperature and solar irradiation, system parameters such as current as well as voltage at Maximum power point, and performance metrics. The random forest classifier can be used as a tool for proactive maintenance and fault diagnosis in PV systems, leading to improved system performance and reliability. The proposed approach is tested on global real data from a PV system and shows promising results in accurately diagnosing faults in the PV system with a precision of 100% for current classification and 99% for voltage classification in few seconds response time for each of the two parameters current and voltage.

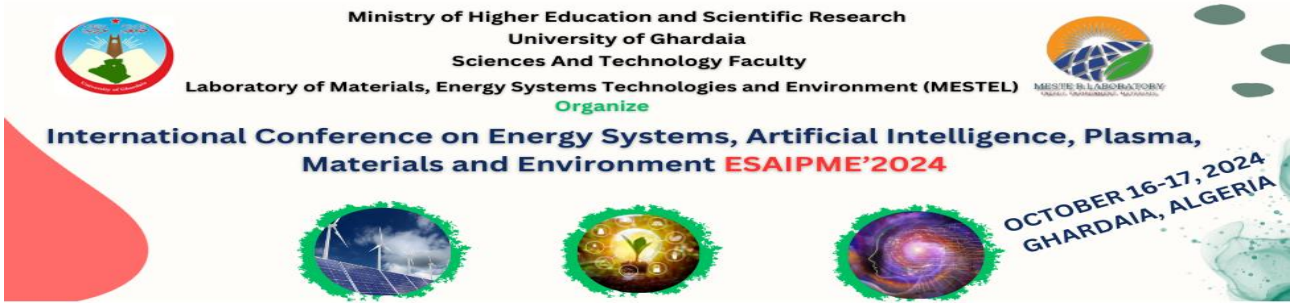
Keywords: PV setup, faults, isolation, diagnosis, Random Forest classifier.

Hybrid Solar Tracking System Using Artificial Neural Network and Fuzzy Logic Control for Optimized Photovoltaic Energy Capture

Abdellatif Tahtah [1,2], Zoubir. Zahzouh [2] and Hassen. Kaddour[3]

[1] Department of Mechanical Engineering, University of Souk Ahras, P.O. Box 1553, Souk Ahras, 41000, Algeria.
[2] Laboratoire de Recherche en Électromécanique et Sûreté de Fonctionnement, LRESF Laboratory, University of Souk Ahras, P.O. Box 1553, Souk Ahras, 41000, Algeria.
[3] Department of Science and Technology, Faculty of Sciences and Applied Sciences, University souk ahras, Algeria.

Abstract. This study presents a hybrid approach for sun-tracking in photovoltaic systems, combining an artificial neural network (ANN) with a fuzzy logic controller (FLC). The ANN predicts solar altitude and azimuth from date and time inputs, providing reference values for the FLC. The FLC drives a dual-axis solar tracking mechanism by regulating the rotational speed of two DC motors, adjusting the tracker's altitude and azimuth respectively. Simulations show that the ANN-FLC system accurately follows the sun's trajectory. By integrating intelligent positioning from the ANN with the adaptive, rule-based control of the FLC, the system precisely aligns solar panels to maximize energy yield. This tight coupling between machine learning forecasting and fuzzy control enables efficient solar energy capture under dynamic and uncertain operating conditions, leveraging the ANN's learning capabilities and the FLC's ability to handle imprecision and nonlinearities.



Keywords: Hybrid Solar Tracking, Artificial Neural Network (ANN), Fuzzy Logic Control (FLC), Photovoltaic Energy Optimization, Dual-Axis Solar Tracker.

Optimized MPPT Control Using Genetic Algorithms for Boosted Photovoltaic Systems in Changing Environmental Conditions

Benatallah Yacine[1], Benali Abdelkarim[1]

[1] Department of Electrical Engineering, Institute of Technology, Nour Bachir University Center, El-Bayadh 32000, Algeria.
[1]Instrumentation Laboratory and Advanced Materials Nour El-Bachir, University Center, El-Bayadh 32000, Algeria.

y.benatallah@cu-elbayadh.dz

Abstract. This study introduces a Maximum Power Point Tracker (MPPT) for photovoltaic (PV) systems, employing a Genetic Algorithm (GA) optimization approach. The investigated system architecture comprises a PV module connected to a DC boost converter through an MPPT interface. A novel control algorithm has been developed, leveraging GA to identify the optimal operating point across diverse environmental conditions. Subsequently, the control mechanism generates appropriate driving signals for the MPPT. To validate the theoretical framework, comprehensive simulations were conducted using MATLAB R2023a/SIMULINK, providing empirical support for the proposed methodology.

Keywords:PV system, Maximum power point tracker, Optimization techniques, Genetic Algorithm, Boost converter.

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Materials and Plasma

First-Principles study of the physical properties of tungsten disulfide by CASTEP

Okbi Farid[1,2*]

[1] Technic Sciences Department, Faculty of Applied Sciences, Ibn Khaldoun University – 14000 Tiaret, Algeria
2 Laboratory of Materials for Application and Valorization of Renewable Energy (LMAVER), Amar Telidji University, 03000 Laghouat, Algeria

farid.okbi@univ-tiaret.dz

Abstract. The physics of solid materials plays an important role in technological development. Among these materials are semiconductors. In this work, we studied some physical properties of tungsten disulfide WS2 such as, the structural and electronic properties, these calculations are made by the Castep calculation code which is based on the density functional theory (DFT), the potential of The exchange and correlation is treated by two approximations; The Perdew-Burke-Ernzerhof approximation (GGA-PBE) and the local density approximation (LDA), using the plane-wave coupled pseudopotential (PP-PW) method, implemented in the CASTEP code. The total minimum energy of WS2 is calculated based on the cutoff energy Ecut and the sampling of the point K. Additionally, the balance constant of the network is calculated using the results obtained during the test of energy convergence. The calculated value of the network equilibrium constant is in good agreement with the experimental value. Finally, we discuss the structure and DOS state density of WS2, with the electrical properties of WS2 determined. The work shows that the materials have

potential for use in optoelectronic applications. The simulation results are in good agreement with the available experimental results and theoretical calculations.

Keywords: Physical properties, WS2, DFT, gap energy, band structure.

Equilibrium, kinetic and thermodynamicstudies of the adsorption of atoxicheavymetal "Hg" by zinc oxidenanoparticlesderivedfrom a green synthesis

Mohammed Cherif TERKHI[1], KinzaAmel BELHADJI[1], Sabria TERKHI[2], MouffokRadouane GHEZZAR[1]

[1]Laboratory of Environmental Sciences and Techniques (STEVA), Faculty S.T, Univ. of Mostaganem, Algeria
[2]Laboratory of Solid Technology and Property, Faculty S.T, Univ. of Mostaganem, Algeria

mcterkhi.univmosta@gmail.com

Abstract. Mercuryis a global source of contamination, as itistoxic, does not break down in the environment and canaccumulate in living organisms. The World Health Organisation (WHO) considersmercury to be one of tenchemicals or groups of chemicals of very high concern for public health. In thisstudy, biosynthetic zinc oxidenanoparticles (ZnO-NP) derivedfrom acacia salignabarkwereapplied for the first time to eliminatethistoxicmetal. The bioadsorbentwascharacterized by FTIR, XRD and SEM. Batch tests werecarried out to verify the impact of parameterssuch as Hg concentration, solution pH, adsorbent mass, temperature and contact time variations on Hg adsorption performance. Maximum removal rate of 99.75% wasobtainedat a pH of 5, a biosorbent dosage of 0.15 g/L and a contact time of 50 min. The adsorption isotherm data showedthat the adsorption processwasmainlymonolayer on ZnO-NP. The adsorption processfollows pseudo-second-orderreactionkinetics (R^2=0.98). The values of the thermodynamicparameters (ΔH^0, ΔG^0 and ΔS^0) provedthat the adsorption processwasspontaneous and endothermic.

Keywords: Green Chemistry, Nanoparticules ZnO, Acacia salignabark, Mercury, Bioadsorption.

Comprehensive Evaluation of MIP-202 Metal-Organic Framework for Enhanced Adsorption in Environmental Applications

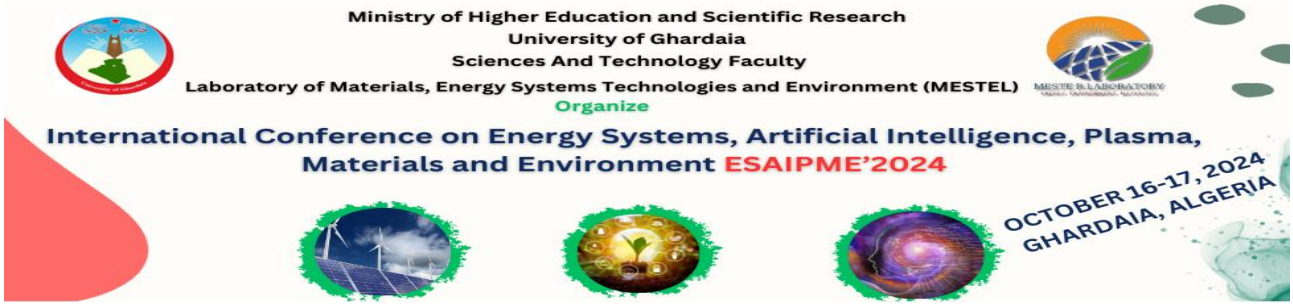
Mokri Hafsa[1] and Boukli-Hacene Leila[1]

[1]Laboratory of Inorganic Chemistry and Environment, Faculty of Sciences, University of Tlemcen, Tlemcen, Algeria

rmahafsa@gmail.com

Abstract. Over the past 50 years, we have witnessed the emergence of water pollution caused by industrial effluents. In this context, the application of Metal-Organic Frameworks (MOFs) in wastewater treatment is a promising technology that has garnered increasing interest. This study aimed to eliminate a cationic dye from the phenothiazine family, known as methylene blue, using the Metal-Organic Framework MIP-202. To optimize the degradation of this dye, various parameters were studied, including the initial pH of the solution, the initial dye concentration, and the adsorbent mass. The adsorption of methylene blue was monitored by UV/Vis spectrophotometry. The results indicate that a removal efficiency of 80% was achieved after 180 minutes of treatment under optimal conditions: T=20°C, pH=6.7, [MB]=10 mg/L, m(MIP-202)=60 mg.

Keywords:water pollution, Metal-Organic Frameworks, wastewater treatment, methylene blue, MIP-202, adsorption.



Structural and Electronic Properties of Graphene, Silicene and Germanene Doped with P, Ti and Fe

S. Tazekritt, A. Kellou, M. Gallouze

Theoretical Physics and Didactic Laboratory, Faculty of Physics, University of Science and Technology Houari Boumediene (USTHB), P.B. N°32 El-Alia, Bab Ezzouar, Algiers.

stazekritt@usthb.dz

Abstract. Silicene and germanene are sheet consisting of a single layer of, silicon and germanium atoms respectively, organized in a honeycomb structure like graphene. Their band structures show a metallic character giving a zero gap with a linear dispersion at point K. The similarity of silicene and germanene stems from the fact that they belong to the same group in the periodic table of elements. In addition, the larger atomic rays of silicon and germanium favor sp^3 hybridization.

In this work, we study the effect of phosphorus (P), titanium (Ti), and iron (Fe) doped on the structural and electronic properties of graphene, silicene and germanene. The incorporation of these atoms has significant implications on their structural and electronic properties with a perturbation of the crystalline lattice symmetry. They remove the energy levels at the Dirac point, resulting in the opening of a gap in the band structure.Furthermore, the differences in electronegativity between the atoms and induced charge transfers, which also contribute to the formation of this energy gap.

Keywords:2D materials, doped atoms, structural properties and electronic gap.

Synthesis of Clay- Microcrystalline Cellulose Films for Medical Bench Cover

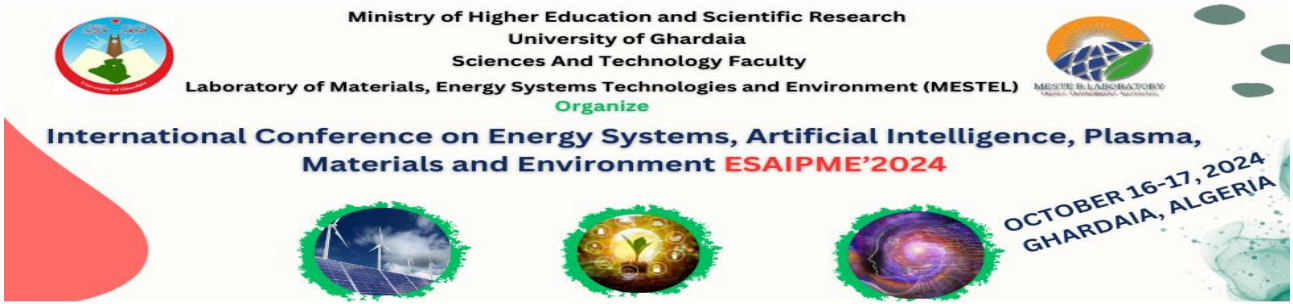
Karima BAGHDAD[1,2]*, Abdelkader BENDERRAG[3,4], Fatima BERREBIA[5], Abdelkrim M. HASNAOUI[2]

[1]University of Science and Technology of Oran - Mohamed Boudiaf,P.O. Box 1505, Bir El Djir 31000, Oran, Algeria.
[2]Laboratoire de chimie des matériaux / Université Oran1-Ahmed Ben Bella, P.O. Box 1524, Oran 31005, Algeria.
[3]Laboratoire physique-chimie des matériaux catalyse et environnement LPCMCE/Université des Sciences et de la Technologie d'Oran Mohamed-Boudiaf USTOMB.Oran, Algérie.
[4]Université Oran1-Ahmed Ben Bella, P.O. Box 1524, Oran, 31005 Algeria.
[5]Laboratoire de Chimie et d'Electrochimie des Complexes Métalliques- LCECM/ University of Science and Technology of Oran - Mohamed Boudiaf, P.O. Box 1505, Bir El Djir 31000, Oran, Algeria.

baghdad.karima@yahoo.com

Abstract. Synthesis of films based on microcrystalline cellulose and halloysite-type clays was carried out using two methods. These films are investigated for medical bench cover. The resulting bio composites were characterized by infrared spectroscopy and X-ray diffraction, their antimicrobial activity was tested for three reference strains, including Staphylococcus aureus (SA), Escherichia coli (EC), and Pseudomonas aeruginosa (PA). Natural extracts such as sage, clove, and ginger were used as active substance to enhance their inhibition. The results showed limited activity for low concentrations.

Keywords: Microcrystalline cellulose, Clay, Bio composite, Antibacterial activity, Medical Bench Cover.



Structural and Thermodynamic Properties of Mg_2FeH_6 : DFT Study.

Leila Rouaiguia*[1], Nourelhouda Mosteghanemi†[1], Lyacine Rabahi[2] and Abdelhafid Kellou[1]

[1]Theoretical Physics and Didactics Laboratory, Faculty of Physics USTHB, Algiers, Algeria
[2] Research Center in Industrial Technologies (CRTI), BP 64, Cheraga, Algiers, Algeria

nmosteghanemi@usthb.dz

Abstract. The complex diamagnesium iron hydrides have potential applications in optoelectronics, thermodynamics, and heat storage (1). Additionally, they are promising for use in solid state batteries (2) and antireflection coatings. In the recent years, Mg_2FeH_6 has emerged as a highly attracting material for hydrogen storage applications. This material possesses the greatest volumetric hydrogen density of 150 Kg/m3 and gravimetric hydrogen capacity of 5.66 wt% (3) surpassing even liquid hydrogen. Moreover, this hydride is made up from nonstrategic metallic elements (Mg and Fe), reducing thereby its commercial price significantly, and made it lower than that of conventional hydrides (e.g., Mg_2MH_x (M=Co, Ni)). In view of this, researchers have focused on exploring its physical properties, including the structural, electronic, optical, and optoelectronic properties, using both DFT calculations (4) and experimental techniques (1). The present work aims to investigate the structural and thermodynamic properties of Mg_2FeH_6 by means of density functional theory (DFT) calculations. Some thermodynamic properties, such as Debye temperature, heat capacity, entropy and Helmholtz free energy are carried out applying the Gibbs program. The obtained results are discussed and compared to the available experimental and theoretical studies.

Keywords:Mg_2FeH_6 hydride, DFT, Hydrogen storage material, thermal properties.

The biological, photocatalytic and adsorption properties of biosynthesised MnO nanoparticles used in pollution control.

Kinza Amel Belhadji [1], Mohammed Cherif Terkhi [1], Fatiha Abassene [1], Nadia Messaoudi [1], Leila Bendahmane [1], Fatima Zohra Benkrifa [1], Fatiha Abdelmalek [1], Ahmed Addou [1]

[1]Laboratory of Environmental Sciences and Techniques (STEVA), Faculty S.T, Univ. of Mostaganem, Algeria

Kenzaamel.belhadji@univ-mosta.dz

Abstract. We report the synthesis of MnO nanoparticles using biological plant leaf extract molecules. They were then studied for their potential for photocatalytic degradation of dyes against methyl violet (MB), and their adsorption activity against Cr(VI) was also determined. PANs were also evaluated for their antioxidant and antibacterial activity and against various clinical and reference pathogenic microbes (Escherichia coli, Staphylococcus aureus and Bacillus subtilis). Scanning electron microscope (SEM), X-ray powder diffraction (XRD), energy dispersive X-ray (EDX) and Fourier transform infrared spectroscopy (FTIR) results confirmed the successful synthesis of PANs with spherical morphology and crystalline nature. The synthesised PANs showed better Methyl Violet photocatalysis properties under sunlight than under an ultraviolet lamp. Cr(VI) adsorption results showed that the synthesised PANs effectively adsorbed more Cr(VI) at acidic pH than at basic pH. The biological activity results showed that the PAN AI-MnO synthesised exhibited significant antibacterial properties against pathogenic microbes, compared with the plant extract. These excellent biological activity results are attributed to the existence of biological plant molecules on their surfaces and to the small size of the particles (synergistic effect). Consequently, the current results suggest that plant leaves are a valuable source for tailoring the potential of PANs for various types of Cr(VI) adsorption, methyl violet degradation and the destruction of pathogenic bacteria.

Keywords: Photocatalytic effect, adsorption, antibacterial activity, depollution, nanoparticules

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Prediction of Mechanical Properties of Friction Stir Welding of Aluminum Alloy 6082-T6

Mohammed Abdelghani Ben Messaoud[1], Mohammed Nadhir Djamel Eddine Cherief[1], Abdelkader Miloudi[1], Amine Mehdi Fihakhir[2]

[1] Laboratory of Materials and Reactive Systems (LMSR), University of Djillali Liabes, Sidi Bel Abbès
[2] department of automatics and electromechanics, university of Ghardaia

Abstract. Friction stir welding (FSW) is a very complex process because it depends on both internal and external factors of the material under consideration. The purpose of the present work is to formulate mathematical modeling to analyze the effects of welding parameters (Spindle speed, welding speed, shoulder penetration, shoulder profile) on the mechanical property of tensile strength at the welded joint of 6082-T6 aluminum alloy. The mathematical model is developed by response surface methodology (RSM). This model makes it possible to construct an optimization model taking into account the effect of different operating parameters. It should be noted that the developed model provides acceptable error limits compared to the experimental data.

Keywords: Friction stir welding, Model mathematical, Aluminum alloy 6082, T6, Tensile strength.

Doped Ga_2O_3 thin films by sol-gel method: optical, structural, and morphological properties

Amraoui Fatma[1], Sengouga Noureddine[1], Lobna Messeddek[1]

[1] Laboratory of metallic and semiconducting materials LMSM, Mohamed Khider University, Biskra 07000, Algeria.

fatma.amraoui@univ-biskra.dz

Abstract. Gallium oxide (Ga_2O_3) is a promising material for optoelectronic devices development. it is emerging in the field of wide-bandgap semiconductors for various applications, such as solar-blind photodetectors et al., because of its wide bandgap. For this reason, in this study, the structural properties of undoped and aluminum-doped gallium oxide (Ga_2O_3) thin films deposited on sapphire substrates by sol-gel (spin coating) are analyzed using XRD, and the optical properties of doped gallium oxide by sol-gel method are analyzed. Therefore, the annealing temperature of the samples is set at 1050 °C. The optical bandgap of films is calculated based on the transmittance value measured from a UV-visible spectrophotometer, which ranges from 4.8 eV to 5.0 eV. Scanning electron microscopy of the prepared samples revealed dense surface morphologies.

Keywords: Gallium oxide, sol gel, optoelectronic, applications, low-cost.

Investigation of Electromagnetic Properties of a Composite Material Based on Epoxy Resin Using X-Band Microwave Test Bench Characterization Technique

BENGHERBIA Ayoub[1]

[1] Laboratory of Advanced Electronic Systems (LSEA), Department of Electrical Engineering, Faculty of Technology, University of Yahia Fares, Medea 26000 Algeria

bengherbia.ayoub@univ-medea.dz

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Abstract. The goal of this article is to employ the characterization technique using a Microwave Test Bench to investigate the electromagnetic properties (such as permittivity, conductivity, etc.) of an Epoxy Resin composite material and observe its dielectric behavior at various X-band [8–12GHz] frequencies.

Keywords: characterization, microwave, electromagnetic, permittivity, X-band.

Synthesis and Characterization of LDPE/MgO Nanocomposite Films for Enhanced Electrical Insulation Performance

Hamed BOUKHARI, Kiouas Djihad, Ben Koumar Karima, Khane Yasmine

Laboratoire Materials Energy Systems Technology and Environment, Université de Ghardaia, BP 455 Ghardaia 47000, Algérie

In this study, the focus was on the fabrication of a nanocomposite polymer film aimed at enhancing electrical cable insulation properties. The magnesium oxide nanoparticles MgO-Nps were synthesized using an environmentally friendly sol-gel auto-combustion technique with two different plant extracts the Tazia (Asphodelus Tenuifolius) found in Ghardaïa and the sage (Salvia officinalis) found in Blida. The nanocomposite polymer was prepared by blending low density polyethylene LDPE with magnesium oxide nanoparticles to create a new material with improved electrical insulation properties. The composite material underwent several physical and chemical analyses to determine its properties and optimize its performance. The formation of magnesium oxide (MgO) nanoparticles was confirmed, on their size and shape was studied using a scanning electron microscope (SEM), which showed that the nanoparticles were mostly spherical. The energy-dispersive X-ray (EDX) spectra also supported the formation of MgO nanoparticles. The crystalline nature and sizes of these nanoparticles were analyzed using X-ray diffraction (XRD), which indicated a face-centered cubic structure, with different sizes for the two plants, respectively (30.15 and 59.02) nm. In addition, the polymeric composite film containing magnesium oxide nanoparticles extracted from the Tazia plant was analyzed using scanning electron microscopy. This analysis revealed the morphology of the sample's surface and confirmed the distribution of the particles on the surface of the film, which contributed to improving the electrical insulation properties of the composite. After completing the analysis of the polymeric composite film, several electrical tests were conducted to assess the electrical insulation properties, including the dielectric constant, volumetric resistance, loss factor, and dielectric strength, and the results showed that the performance was good and met expectations.

Keywords: MgO-Nps, sage, Tazia, sol-gel auto-combustion, LDPE/MgO nanocomposites, Electrical cable insulation.

Comparative Analysis of Structural and Electrical Properties in Un-doped and Bi-doped Lanthanum Ferrite Nanoparticles

BELGUENOUNE Ahmed[1,*], OULDHAMADOUCHE Nadir[1], BASSAID Salah[1], DEHBI Abdelkader[1], and CHAKOUR Naziha[1]

[1]Engineering Physics Laboratory, University of Tiaret – Algeria

ahmed.belguenoune@univ-tiaret.dz

Abstract. Perovskite materials (ABO_3) are attractive due to their excellent functional properties, including ferroelectricity, piezoelectricity, and pyroelectricity. By modifying their composition through anionic (O) and/or cationic (A and/or B sites) substitutions, their performance can be optimized for various Nanoelectronics applications, such as Multilayer Ceramic Capacitors (MLCC), Positive Temperature Coefficient Resistors (PTCR), and Ferroelectric Random-Access Memory (FRAM).

This work examined the structural and electrical characteristics of perovskite nanoparticles, specifically $LaFeO_3$ and $La_{0.95}Bi_{0.05}FeO_3$, synthesized using a solid-state reaction. X-ray diffraction (XRD) was used to investigate the structural properties. Both samples exhibited a single-phase orthorhombic crystal structure with a Pbnm space group. XRD analysis revealed that Bi substitution for La slightly increased the lattice parameter, crystallite size, and lattice strain.
Impedance spectroscopy was employed to investigate the electrical properties, such as impedance, dielectric constant, dielectric loss, and conductivity. The impedance spectroscopy measurements were performed at room temperature using an RLC meter, covering a frequency range from 75 kHz to 1 MHz. The Nyquist plots approach a semicircular shape within the measured frequency range, indicating bulk (grain) conduction. Substituting Bi for La reduces the semicircular arc diameter, signifying increased conductivity. The absence of any peak in the Bode plots indicates an absence of relaxation within this frequency range. Dielectric losses remain below 0.03 across the entire frequency range for both samples and decrease monotonically with increasing frequency. Bi substitution increases the dielectric constant and AC conductivity, likely due to oxygen vacancies and charge hopping.

Keywords: $LaFeO_3$, Nyquist plot, Dielectric constant, Impedance spectroscopy, XRD.

Extraction of lanthanum (III) by a magnetic nanocomposite

GHITRI Feriel[1], BELKHOUCHE Nase-eddine[1], OUKEBDANE Khali[1], FEDDANE Souad[1]

[1]Separation and Purification Technologies Laboratory, Department of Chemistry - Faculty of Science, University of Tlemcen – Algeria

feriel.ghaitri@uni-tlemcen.dz

Abstract. In recent years, magnetic nanocomposites have attracted considerable attention due to their physical, chemical and magnetic properties, and can be applied in various fields such as magnetic storage devices, mineral separation, catalysis, magnetic refrigeration systems and magnetic resonance imaging (MRI). The application of magnetic nanocomposites in the field of wastewater treatment and metal recovery is becoming an interesting area of research. They offer good adsorption efficiency for metal species and can be easily synthesised. The aim of our research is to apply a metal oxide-based nanocomposite as an adsorbent in the extraction of lanthanum (III) from an aqueous medium. These magnetic nanocomposite was characterised by surface area (BET) and zeta potential measurements, Fourier transform infrared spectroscopy (FT-IR) and X-ray diffraction (XRD). The effects of various parameters were studied: stirring time, pH, initial lanthanum(III) concentration, quantity of adsorbent and temperature.
The results indicate that 20 minutes are sufficient for quantitative extraction at an optimum pH of 5.6.The adsorption of lanthanum(III) was best described by pseudo-second-order kinetics. The Langmuir isotherm was well suited to adsorption equilibrium measurements compared with the Temkin, Freundlich and Dubinin Radushkevich isotherms. Thermodynamic studies showed that the adsorption system was spontaneous at room temperature and endothermic. All these results make magnetic nanocomponents a suitable adsorbent for practical application and can be exploited in the development of wastewater treatment processes.

Keywords: Nanocomposite magnetic, Extraction, Lanthanum(III) , Materials, Adsorption.

Synthesis and characterization of the LaFeO3 perovskite by samarium substitution: La(1−x)SmxFeO3

CHAKOUR naziha[1], BASSAID Salah[1], DEHBI Abdelkader[1], OULDHAMADOUCHE Nadir[1], and BELGUENOUNE ahmed[1]

Ministry of Higher Education and Scientific Research
University of Ghardaia
Sciences And Technology Faculty
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GHARDAIA, ALGERIA

[1]Engineering Physics Laboratory University of Tiaret – Algeria

naziha.chakour@univ-tiaret.dz

Abstract. Thanks to their interesting properties, perovskites are used in various fields, including in the fields of catalysis, energy and the environment.
In our study we synthesized the LaFeO3 phase using the solid-state reaction synthesis method. And we studied the effect of replacing La+3 with Sm+3 on the structural properties of the Ferrite La1-x SmxFeO3 oxide series (with x = 0, 0.025, 0.05, 0.10 and 0.15).
Structural analysis by X-ray diffraction DRX and Rietveld refinement by LFO substitution by samarium La(1−x)SmxFeO3 show that the LSFO sample is well crystallized in a perovskite structure of orthorhombic system with the Pnma space group. And the structural parameters and the crystallite size of these ferrites were affected by the substitution of lanthan with samarium.

Keywords:perovskite, LaFeO3,LSFO, solid state and La(1−x)SmxFeO3.

Characterization of n-MCM-41 Material modified by Impregnation Method

Ahlam Belabed[1], Mohammed Sadou[1]

[1] Materials Chemistry, Catalysis and Reactivity Laboratory, Hassiba Ben Bouali University of Chlef, P.O. Box 151, Hay Salem Chlef 02000, Algeria

a.belabed@univ-chlef.dz

Abstract. The objective of this study is to develop the textural and structural properties of hexagonal mesoporous materials (MCM-41) in the field of heteroatom incorporation catalysis. The specific properties of mcm-41 materials are highly dependent on the preparation method. We have synthesized pure nickel-modified mesoporous MCM-41 materials with a molar ratio of Si/Ni=10 using the hydrothermal and impregnation methods, with tetraethylorthosilicate as the silica source and (CTABr) as the surfactant. The synthesized materials were characterized by various physicochemical analysis methods such as infrared spectroscopy, X-ray diffraction, ATD/ATG thermal analysis, and to confirm the porosity of our materials we used the BET/BJH method. The results showed that the modified materials have a hexagonal structure and that the presence of nickel oxide on the surface of the materials and in their pores enhances their catalytic activity. We observed that the specific surface area of the materials decreased from 974.539 m^2/g to 345.909 m^2/g, while pore size decreased from 1.30 cm3/g to =0.829 cm3/g after metal incorporation.

Keywords: MCM-41, Mesoporous materials, Surfactant, Impregnation.

Synthesis of Clay - Microcrystalline Cellulose Films for Medical Bench Cover

Karima, BAGHDAD[1,2]*, Abdelkader, BENDERRAG[3,4], Fatima, BERREBIA[5], Abdelkrim M. HASNAOUI[2]
[1]University of Science and Technology of Oran - Mohamed Boudiaf,P.O. Box 1505, Bir El Djir 31000, Oran,Algeria.
[2]Laboratoire de chimie des matériaux / Université Oran1-Ahmed Ben Bella, P.O. Box 1524, Oran, 31005 Algeria.
[3]Laboratoire physique-chimie des matériaux catalyse et environnement LPCMCE/Université des Sciences et de la Technologie d'Oran Mohamed-Boudiaf USTOMB.Oran, Algérie.
[4]Université Oran1-Ahmed Ben Bella, P.O. Box 1524, Oran, 31005 Algeria.
[5]Laboratoire de Chimie et d'Electrochimie des Complexes Métalliques- LCECM/ University of Science and Technology of Oran - Mohamed Boudiaf, P.O. Box 1505, Bir El Djir 31000, Oran, Algeria.

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baghdad.karima@yahoo.com

Abstract. Synthesis of films based on microcrystalline cellulose and halloysite-type clays was carried out using two methods. These films are investigated for medical bench cover. The resulting bio composites were characterized by infrared spectroscopy and X-ray diffraction, their antimicrobial activity was tested for three reference strains, including Staphylococcus aureus (SA), Escherichia coli (EC), and Pseudomonas aeruginosa (PA). Natural extracts such as sage, clove, and ginger were used as active substance to enhance their inhibition. The results showed limited activity for low concentrations.

Keywords: Microcrystalline cellulose, Clay, Bio composite, Antibacterial activity, Medical Bench Cover.

Synthesis of Zn-Pb composite coatings for corrosion resistance

Safa Benamor[1] and Malika Diafi[2]

[1] Biskra University, Biskra NJ 07000, Algeria

m.diafi@univ-biskra.dz

Abstract. Nowadays, different methods are used to corrosion resistance. Among these methods, there is an electrodeposition technology which is ease of use and low cost. In this work, describe the effect the concentration of lead on Zn-Pb alloys, In the first step, we prepared the coating using a sulfate electrodeposition bath. Subsequently, we studied the morphological (SEM, EDS, XRD), the corrosion properties studied in a solution of 3 % NaCl in the potentiodynamic polarization measurements (Tafel), and the mechanical (microhardness) properties of the coating.

Keywords: Alloy, Corrosion resistance, Electrodeposition, SEM, XRD,Tafel.

Zn-Co-Al_2O_3: Electrochemical Deposition, Structure and Corrosion Resistance

Louiza Tahraoui[1], Safa Benamor[1] and Malika Diafi[1]

[1]Faculty of Sciences and Technology, Biskra University Algeria

tahraouil@yahoo.fr

Abstract. To strengthen the corrosion resistance of the Zn-Co coating, second-phase nanoparticles are added. Studies have reported the preparation of metal matrix composite coatings using Al_2O_3, TiO_2, ZrO_2 and other particles as reinforcing phases. Among them, alumina (Al_2O_3) nanoparticles are excellent candidates for coating reinforcement due to their chemical stability, practicality and low cost. There are currently few studies on Zn-Co-Al_2O_3 composite coatings, with focusing on the preparation process, which improves the substrate's corrosion resistance to a degree. The present study consists an experimentation of Zn-Co-Al_2O_3 composite coatings. For this, the Al_2O_3 nanoparticules concentration influence was the principal object to improve the corrosion resistance of the composite coating, which has been made by electro-deposition, in plating bath, on steel substrates previously treated. It has been studied by potentiodynamic polarization measurements (Tafel). It is found that the values of corrosion current density (I_{corr}) decrease with the increasing of nanoparticules Al_2O_3 in Zn-Co-Al_2O_3 coating. The results showed the microstructure of two days corroded samples has duplex layer composed of inner and outer (Al_2O_3). The formation of oxide scale rich in anticorrosive Al_2O_3nanoparticles has contributed for the better corrosion resistance. Also, measurements showed that the increase in the Al_2O_3 codeposition in a Zn-Co-Al_2O_3 composite coatings changes the coating protection process

from a sacrificial coating to a protective one. Zn-Co-Al_2O_3 (10 g/l Al_2O_3) composite coating can be considered as good diffusion barrier for steel.

Keywords: Electrodeposition, Al_2O_3, Composite Coating, Corrosion Resistance, Diffusion Barrier.

Investigated of the Physical Properties of Oxide Perovskite YFeO3: ab-initio

Demmouche Soumia[1*], Saidi Fatiha[2,3], Brahmi Nabil Badr Eddine[1]

[1] Department of physics, Laboratory of Theoretical Physics, Faculty of sciences, University of Tlemcen, Algeria
[2] Materials study and Prediction Division (DEPM), Renewable Energy and Materials Research Unit (URMER), University of Tlemcen, Algeria
[3] Higher School of Electrical and Energy Engineering (ESGEEO), Oran, Algeria.

soumia.demmouche@univ-tlemcen.dz

Abstract. First-principles calculations based on density functional theory (DFT) framework using projector augmented wave (PAW) method as well implemented in the Vienna ab-initio simulation package (VASP) [1] are used to study the effect of spin orientation on certain characteristics of perovskite $YFeO_3$ (YFO) [2]. The electron-ion interactions and the exchange correlation energy are described under the Generalized Gradient Approximation and the Hubbard correction (GGA + U) [3]. First, stability of YFeO3 compound is verified and structural properties are calculated. To better understand the behavior of oxides, the spin effect that shows the ground state characteristics of oxides is very useful. Therefore, magnetism is examined by considering four sequences: ferromagnetic (FM), antiferromagnetic A-type (A-AFM), antiferromagnetic C-type (C-AFM), and antiferromagnetic G-type (G-AFM), The total energies (E_0) calculated for each configuration are summarized in Table 1. It can easily be seen that total energy of G-AFM order is lower than energies of other orders which indicates that the G-AFM order is most favored for $YFeO_3$. Furthermore, the calculated density of states proposed in this work indicated that YFO behaves as a semiconductor, with a bandgap of approximately 2.90 (eV). This result is consistent with findings from experimental studies, validating the theoretical predictions obtained from the DFT calculations [2].
To complete the fundamental characteristics of these compounds we have analyzed the mechanical properties. Overall, through comprehensive theoretical analyses, this study aims to provide a thorough understanding of $YFeO_3$, encompassing its magnetic, electronic, and mechanical behaviors, crucial for evaluating its applicability in advanced technologies such as photovoltaics and optoelectronics.

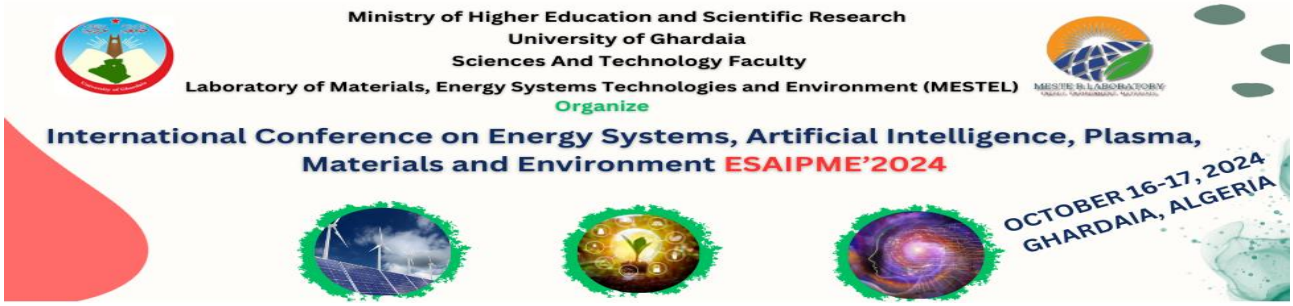
Keywords: ab-initio Study, Electronic Properties, Magnetic Properties, Oxide perovskite.

Effect of stabilizers on the optical band gap and carbon clusters of LDPE films under natural weathering in Ghardaïa, Algeria

Souad Behissa*[1], Salem Fouad Chabira[1], Dalila Mouattah[2], and Mohamed Sebaa[1]

[1] Mechanics Laboratory (Lme)-RFME, Faculty of Technology, Amar Telidji University, Laghouat – Algeria
[2] Department of Material Sciences, Laboratory Physico- Chemistry of Materials (LPCM), Faculty of Science, Amar Telidji University, Laghouat – Algeria

behissasouad@gmail.com



Abstract. This study investigates the optical properties of low-density polyethylene (LDPE) films exposed to natural weathering at a sub-Saharan facility in Ghardaïa, Algeria. A comparison was conducted between stabilized and unstabilized samples using UV-Vis absorption spectroscopy and Tauc's equation to determine the optical band gap (Eg) and the number of carbon atoms in C=C unsaturation (N). The results indicated that the energy gap was higher in the unstabilized samples compared to the stabilized ones before aging. However, the energy gap decreased with aging in the unstabilized samples, while the number of carbon atoms in C=C unsaturation changed inversely. No significant changes were observed in either Eg or N with aging in the stabilized films. This stability is attributed to stabilizers in the LDPE structure, which reduces light transmission and helps maintain consistent optical properties.

Keywords: Aging, Optical properties, LDPE films, Stabilizers, Tauc's equation, UV, Vis spectroscopy.

Physicochemical properties of nickel oxide deposited by magnetron-assisted sputtering for photovoltaic applications

Nadir Ouldhamadouche[1] and Boubakeur Essedik Belkerk[2]

[1]Laboratoire de Génie Physique, Université Ibn Khaldoun, BP P 78 Zaâroura, Tiaret 14000, Algeria
[2]Universités de Constantine, Laboratoire Microsystèmes et Instrumentation (LMI), Université Constantine

ouldhamadouche@gmail.com

Abstract. This work is devoted to the study of the growth of thin layers of Nickel oxide (NiO) by reactive magnetron sputtering (DC) with a view to evaluating its properties for use as a buffer layer at the electrode/organic semiconductor interface in a photovoltaic cell in order to increase efficiency and lifespan. Physico-chemical (SEM, DRX, XPS, EDX) and optical (UV-visible-NIR) analyzes allowed us to determine the effect of deposition parameters (pressure, deposition duration and percentage of oxygen) on the properties films obtained. The Nickel oxide films produced have preferential orientations along the (111) or (200) directions with a well crystallized structure. Furthermore, the cathode voltage profile allowed us to adjust the stoichiometry of the produced films. Samples deposited at the absolute maximum cathode voltage are close to stoichiometric NiO. Therefore, the optical properties of thin films are directly influenced. Samples produced under stoichiometric NiO conditions exhibit the greatest transparency. Furthermore, the fabricated cells show good performance using NiO as a buffer layer between the ITO/organic cell interfaces.

Keywords: Magnetron sputtering, NiO,PVD, DC, ITO, organic cell.

Impact of Laser Fluence on AlN Plasma Emission

Adel TEKILI[1[1,2]], Salima BOUTICHE[2[1]], Samia KALOUNE[2[2]], Slimane LAFANE[2[2]] and Samira ABDELLI-MESSACI[1[2]].

[1] Faculty of Chemistry, University of Sciences and Technology, Houari Boumediene (USTHB), BP 32 EL Alia 16111 Bab Ezzouar Algiers, Algeria.
[2] Division Milieux Ionisés et lasers, Centre de Développement des Technologies Avancées (CDTA), Cité du 20 août 1956 BP 17, Baba Hassen, Algiers, Algeria.

tekili7513adel@gmail.com

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Abstract. Influence of laser fluence on AlN plasma behavior induced by infrared na-nosecond laser from AlN target has been investigated into vacuum using optical emission spectroscopy diagnostics. In the range of 7 to 31 J.cm^{-2} the temporal profile of Al^{+} shows an evolution from a single component to double components and back to a single component with increasing laser fluence. While the temporal profiles of Al and Al^{2+} described by a single component. A plateau was observed for the expansion velocities of Al^{2+} at higher fluences. Additionally, we have study the impact of the laser fluence on the spatial distribution of Al species and on the electron density of AlN plasma.

Keywords: Laser ablation, AlN Plasma, Optical Emission Spectroscopy (OES).

Improved power generation based on deformation of lead zirconate titanate (PZT) piezoelectric ceramics for energy harvesting applications with renewable energy.

Sadok HADJADJ[1*], Ahmed BOUTARFAIA[1]

1* Lab. Radiation and Plasmas and Surface Physics,
K.M University, Ouargla 30 000, (Algeria).

hadjadj.sadok@univ-ouargla.dz

Abstract. Researchers are currently increasingly interested in generating electrical energy to cover the increasing demand of energy consumption thanks to piezoelectric converter technology. Accordingly, this study is based on different piezoelectric materials (ceramics) to better understand their properties under the influence of mechanical stress or vibration and electric field during energy harvesting using converter devices.Recently, the demand for inventions related to renewable and clean energy has increased to reduce pollution levels. Power generation using vibration based on piezoelectric materials is a very promising field. The power generated by piezoelectric materials at the micro to milliwatt level is very suitable for charging and powering portable devices, operating low-power sensors, etc. In this study, solid solutions of piezoelectric and dielectric ceramics:$Pb_{1-(x+y)}$ Lax Nd_y $[(Zr_{0,524}\ Ti_{0,476})_{1-(5w+3z)/4}\ Nb_w]\ O_3$ + z % wt Cr_2O_3 abbreviated PLNZCNT were prepared by conventional solid state reaction methodwhere z = 0, 0.5, 1, 2.5, and 5 mol%. Using different techniques such as X-ray diffraction (XRD) which reveals the phase of the samples forming the mixture (morpho-tropic phase boundaries MPB). Scanning electron microscopy (SEM) which shows the grain size, dielectric measurements were performed to understand the effect of Cr content on the properties of PLNZCNT ceramics. Increasing the chromium content in the crystal lattice led to a significant change in the dielectric properties. The optimum dielectric parameters (εr = 18964,9567 , tan δ_{Tc} = 0.09058 and Tc = 623 K). Were determined for a content of 0.5 mol % of Cr .sintered at 1170 °C were found to achieve excellent dielectric properties

Keywords: PZT, PLNZCNT, Piezoelectric, Dielectric loss, renewable energy.

DFT-Based Calculations of the Structural, electronic properties and phase transition of InxGa1-xSb ternary alloys

Ouarda. Nemiri[1, 2], Fayçal. Oumelaz[1, 2], Djamal. Boudjaadar[1, 2], Akila. Boumaza[3], Rabab Benredouane[1]

[1] Higher Normal School of Technological Education of Skikda, Algeria
[2] Laboratory of Physical Chemistry and Biology of Materials (LPCBM), Département of Physics, High School of Technological Teaching of Skikda, Skikda, Algeria

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[3] Laboratory LPR, Department of Physics, Faculty of Science University Badji Mokhtar, Annaba, Algeria

ouardaphy@yahoo.fr

Abstract. In this work, we study the structural, electronic properties and we will investigate the most stable phase, also calculate the transition pressure from phase to another for the InxGa1-xSb ternary alloys via first principles calculations based on a full potential linearized augmented plane wave method (FP-LAPW) within density functional theory (DFT) integrated in the WIEN-2k code. We are studied the zinc blend (ZnS) and rocksalt (NaCl) structure. For structural properties, the generalized gradient approximation (WC-GGA) scheme was used .The results obtained show that the most stable structure among the two structures studied is the zinc blend structure (ZnS). Furthermore, we have calculated the transition pressure from the ZnS structure to the NaCl structure. For the electronic properties, we have used the modified Becke-Johnson (mBJ) approximation. The structure of energy bands, the type and the value of the band gap of the studied ternary alloys were determined. The results obtained are in good agreement with the available experimental and theoretical data.

Keywords: InxGa1-xSb, WC-GGA, ZnS, NaCl, phase stability.

Investigating the structural and electronic properties of quaternary Heusler alloys through density functional theory (DFT)

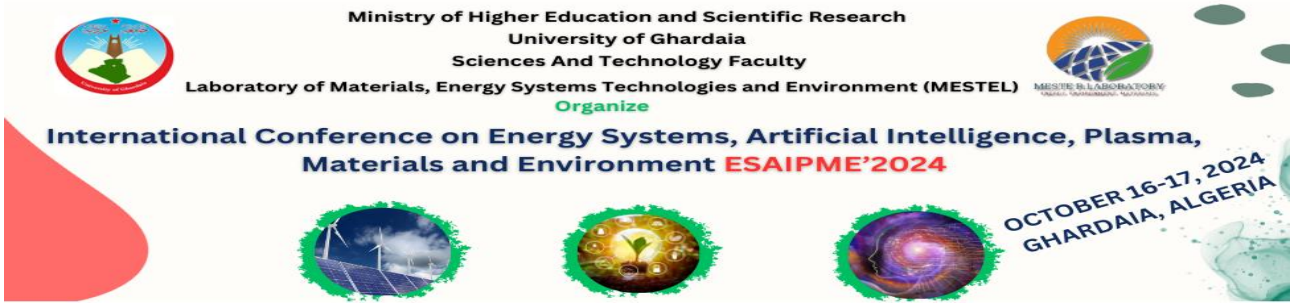
Sassoui khadidja[1]

[1] Department of Physics, Faculty of Science, University of M'sila, ALGERIA.

sassouikhadidja96@gmail.com

Abstract. In this study, we introduce a new category of quaternary Heusler compounds known for their stable semiconductor properties. Recently discovered, these semiconductors contain 18 valence electrons per unit cell and are utilized in thermoelectric devices. We employed density functional theory (DFT) using the WIEN2k code to explore three configurations: Phase I, II, and III, each with a cubic structure. We assessed the band gaps using both the GGA-PBE method and TB-mBJ calculations. The band gap measurements for the quaternary Heusler semiconductor LiTiPtX (X:Al, Ga) showed values of 0.998 eV for LiTiPtAl and 1.059 eV for LiTiPtGa using the GGA-PBE method. These values increased to 1.107 eV and 1.208 eV, respectively, in the TB-mBJ calculations, classifying these materials as indirect electronic band structure semiconductors.

Keywords: Quaternary Heusler, DFT, Semiconductor, electronic properties.



Semi-empirical and empirical calculation of Kβ/Kα intensity ratios for elements with 31≤ Z≤ 40

Assala HAMIDANI[1,2*], Abdelhalim KAHOUL[1,2], Salim DAOUDI[1,2]

[1]Department of Matter Sciences, Faculty of Sciences and Technology, Mohamed El Bachir El Ibrahimi University, Bordj-Bou-Arreridj 34030, Algeria.
[2]Laboratory of Materials Physics, Radiation and Nanostructures (LPMRN), University of Mohamed El Bachir El Ibrahimi, Bordj-Bou-Arreridj 34030, Algeria.

*:assala.hamidani@univ-bba.dz

Abstract. Providing new empirical and semi-empirical Kβ/Kα X-ray intensity ratios for elements with 31≤ Z≤ 40 is the aim of this st udy. For elements in this range, empirical average Kβ/Kα X-ray intensity ratios are calculated by an interpolation technique based on a known analytical function that is atomic number Z dependent. Moreover, new semi-empirical average Kβ/Kα X-ray intensity ratios have been derived by using a fitting approach for the ratio S = (Kβ/Kα)Exp / (Kβ/Kα)W. A very good agreement is observed between the different findings when these results are compared with theoretical, experimental, and semi-empirical values from recent research.

An investigation using DFT methods on the structural, electronic properties and phase transition of InxB1-xSb ternary alloys

F. Oumelaz [1, 2] O. Nemiri [1, 2] D. Boudjaadar [1, 2] A. Boumaza [2] , R. Benredouane [1]

[1] Higher Normal School of Technological Education of Skikda, Algeria
[2] Laboratory of Physical Chemistry and Biology of Materials (LPCBM),

oumelaz21@yahoo.fr

Abstract. In the present work, we present a theoretical study of the physical properties of In x B 1- x Sb ternary alloys by using the full potential linearized augmented plane wave approach (FP- LAPW) based on the density functional theory (DFT). For the structural properties, we used generalized gradient approximation proposed by Wu and Cohen (WC-GGA). Lattice constant and bulk modulus computed in zinc blende (ZnS) and rocksalt (NaCl) phases.
The electronic properties were determined by using the modified Becke-Johnson (mBJ) potential. The most stable structure of our ternary alloys is the Zinc blende phase. The structural parameters including lattice constants and bulk modulus are in very good agreement with the available experimental and theoretical data. The variation of the lattice constant, bulk modulus and energy gap as a function of concentration of $In_xB_{1-x}Sb$ ternary alloys were studied. Furthermore, the phase stability of $In_xB_{1-x}Sb$ ternary alloys in the zinc blende and rocksalt (NaCl) phases are investigating. In addition, we have calculated the transition pressures (P_t) from the zinc blende (B3) structure to the rocksalt (B1) phase. The results obtained are in good agreement with the available experimental and theoretical data.

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Keywords: DFT , FP-LAPW , $In_xB_{1-x}Sb$, ZnS, NaCl.

Interaction Matrix of Stark and Zeeman Effects in Hot and Dense Plasma

Safia Mokadem[1] and Keltoum Chenini[1] and Mohammed Tayeb Meftah [2]

[1] MESTEL Laboratory, University of Ghardaia
[2] Department of Physics, University of Ouargla

mokademsafia93@gmail.com

Abstract. The abstract should summarize the contents and research findings in short terms, i.e. 200-300 words; justified between the margins and using the font/size specified below.
In this work, we present a theoretical study of the Zeeman-Stark effect in dense and hot plasmas, which is one of the important topics in plasma physics and spectroscopy. The Zeeman-Stark effect is a result of the interaction between electromagnetic fields and the energy levels of atoms, which causes the energy levels to shift and split due to the presence of electric and magnetic .
In this study, we have performed accurate numerical calculations of the interaction matrix elements in the presence of an electromagnetic field. This calculation is based on the use of the Dirac equation, which is one of the fundamental equations in quantum mechanics, as it takes into account the relativistic effects that are important in plasmas.
We focused on the Lyman alpha line, which is one of the lines of the hydrogen spectrum. This study represents an important step towards understanding how electromagnetic fields affect the behavior and interactions of plasmas.

Keywords: Stark-Zeeman effect, Electromagnetic field, Plasmas, Line profiles, Dirac equation, Wave functions.

Optimization of the ion exchange time of soda-lime silicate glass

L.YOUNES[1,2,3] and Z. MALOU HAMIDOUCHE[1,2] and M. HAMIDOUCHE[1,2]

[1] Institute of Optics and Precision Mechanics, Setif 1 University-Ferhat ABBAS, Algeria
[2] Emerging Materials Research Unit, Setif 1 University-Ferhat ABBAS, Algeria
[3] Non-Metallic Materials Laboratory, Setif 1 University-Ferhat ABBAS, Algeria

l.younes@univ-setif.dz

Abstract. Despite the many advantages of glass, fragility remains its main problem. The presence of superficial micro-scratches leads to low mechanical strength. These microcracks act as stress concentrators, thereby promoting their propagation, which leads to breakup. To address this, there are a number of treatment methods by which the mechanical properties of glass can be improved, such as ion exchange.
Hot glass objects are immersed in a molten alkali salt. During the immersion time, the alkali ions in the glass that are close to the surface are exchanged with those in the molten salt. This thermally activated diffusion results in the strengthening of the glass.
In this work, we studied the optimal ion exchange time for a 4mm thick flat soda-lime silicate glass, manufactured by floating by the company Mediterranean Float Glass (MFG), a subsidiary of CEVITAL (Algeria). The ion exchange

was performed in a molten potassium nitrate (KNO_3) bath at a temperature of 480°C for durations of 2, 20, 30, 40, and 50 hours.

Keywords: Glass, strengthening, ion exchange, stresses, instrumented indentation.

Full-Heusler alloys: a future perspective for revolutionizing conventional semiconductor technology

Khadidja Mechehoud[1] and Mohamed Mana[2] and Ghezzar[3] and Aya Righi[1] and Fatima Bendahma[1]

[1] Laboratory of Technology and of Solids Properties, Abdelhamid Ibn Badis University, Mostaganem 27000, Algeria
[2] Biotechnology laboratory applied to agriculture and environmental preservation ,Abdelhamid Ibn Badis University, Mostaganem
[3]Environmental and recovery sciences and techniques, Abdelhamid Ibn Badis University, Mostaganem

khedidja.mechehoud.etu@univ-mosta.dz

Abstract. This study demonstrates the successful application of first-principles calcula- tions for thermal conductivity in promising and environmentally friendly Heusler compounds. We present a systematic analysis of the electronic structure, optoelectronic and thermoelectric properties of two Heusler alloys, Na2TlBi and Na2TlSb. In this work, density functional theory (DFT) calculations with the modified Becke-Johnson (mBJ) approximation are employed to compute their physical properties. The results reveal that these alloys exhibit structural stability, a direct band gap, and strong ultraviolet light absorption, making them suitable candidates for optoelectronic devices.
An investigation of the thermoelectric properties of the two alloys was conducted through calculations. This analysis showed that both alloys possess favorable characteristics, including high electrical conductivity, Seebeck coefficient, and ZT value. The combined optoelectronic and thermoelectric responses suggest these novel Heusler alloys hold significant promise for future applications in optoe-lectronics and renewable energy

Keywords: Heusler ,DFT ,Optoelectronic properties ,thermoelectric properties.

Theoretical Investigation on Ba2DyTaO6 oxide double perovskite

Noureddine Saidi [1] and Amel Abbd [1] and Wissam Benstaali [1] and Kheira Bahnes [1] and Omar Belarbi [1]

[1] Electrical Engineering Department Laboratory of Technology and Solids Properties, University of Mostaganem, Algeria

noureddinesaidi879@gmail.com

Abstract. Double perovskite materials are particularly well suited for energy applications because of their nontoxic, efficient, and environmentally advantageous characteristics. Using the full- potential linearized augmented-plane-wave approach, Ba2DyTaO6 oxide double perovskite was thoroughly examined to investigate the microstructural, magnetic, and optoelectronic properties. The thermodynamic and structural stability were found by computing the phonon properties, tolerance factor, and octahedral factor, respectively. The results show that Ba2DyTaO6 was highly stable. From electronic and magnetic properties, the band edges at the same symmetry points indicate that there is a direct

bandgap in the (ΓV–ΓC) direction in the majority spin, a value equal to 3.793 eV with an overlap in the minority spin. With an integer magnetic moment value of 5.00 μB, the Ba2DyTaO6 compound exhibits half-metallic and ferromagnetic behavior. From optical properties, Ba2DyTaO6 material has high absorption, and can be applied in future optoelectronic applications throughout a wide energy range of the light spectrum

Atomic-scale simulation of the engineering of stable arsenic nanomaterials for nanotechnology applications

Chaouki Siouani [1,2] and Sofiane Safer[2] and Sofiane Mahtout [2]

[1] Department of Material Sciences, Faculty of Sciences, University of Algiers 1, ALGERIA
[2] Theoretical Physics Laboratory, Faculty of Exact Sciences, University of Bejaia, ALGERIA

c.siouani@univ-alger.dz

Abstract. The engineering of V-doped arsenic nanomaterials (VAs n (n = 1-20)) used for nanotechnology applications is studied in this theoretical work using the spin polarized density functional theory (DFT) with the generalized gradient (GGA) approximation implemented in the SIESTA code. The size-dependent physicochemical properties of studied nanoclusters, such as the binding energy, HOMO-LUMO gap, vertical ionization potential, vertical electron affinity, adiabatic electronic affinity and adiabatic ionization potential, total spin magnetic moment, chemical hardness, fragmentation energies and second difference of cluster energies are discussed. Our theoretical investigation reveals that the doped transition metal atom V enhance the stability of pure arsenic clusters. The optimized clusters reveal that the most stable structures and their corresponding isomers have three dimensional configurations. The lowest energy structure of VAs_n generally differs from that of pure arsenic clusters. The relative stabilities have been studied in terms of the binding energies, fragmentation energies and second-order difference of energies for all VAs_n nanostructures. The binding energy per atom of doped arsenic clusters increases with the size n. The fragmentation energies show an oscillating behavior for all structures. The total magnetic moment depends on the geometry, the position of V atom in the cluster, the charge transfer and orbital hybridization.

Keywords: Nanoengineering, DFT, SIESTA, nanomaterials, nanotechnology.

Theoretical Study of Optoelectronic and Thermoelectric properties of double perovskites K_2GeSiX_6 (X = F, Cl, Br and I) compounds: by DFT approach

A. Guesmia[1] and A.Zitouni[1] and B. Bouadjemi[1]

[1] Laboratory of Technology and of Solids Properties, Abdelhamid Ibn Badis University of Mostaganem 27000, Algeria

Aissaguesmia33@gmail.com

Abstract. In this work, we have studied the structural, optoelectronic and thermoelectric properties for halides doubles perovskites compounds K_2GeSiX_6 (X = F, Cl, Br and I). Based on the Linearized augmented plane wave method with full potential (FP- LAPW) method, The previous properties are treated within the (GGA-PBE) and the modified Beck-Johnson correction (mBJ-GGA) approximations. The results show that these compounds have a semiconductor behavior with a direct band gap at Γ-Γ direction with values of 2.30eV, 0.632eV, 0.259 eV and 0.124

eV for K_2GeSiF_6, $K_2GeSiCl_6$, $K_2GeSiBr_6$ andK_2GeSiI_6 respectively.In addition, the high dielectric constant, high absorption coefficient and high optical conductivity suggest that the materials have the potential for a wide absorption range starts from the visible to the ultraviolet of optoelectronic applications, including solar or photovoltaic cells. The thermoelectric properties via this calculation of various parameters: Seebeck coefficient, electrical conductivity, thermal conductivity, power factor and figure of merit; Show that the materials K2GeSiBr6 and K2GeSiI6 can be promising for predispositions thermoelectric.

Keywords: Double Perovskites K_2GeSiX_6; FP-LAPW; Semiconductor; Thermoelectric Properties; Optoelectronic applications.

Theoretical Investigation and Pharmacological Potential of (E)-3-(2-chlorophenyl)-1-(2,5dichlorothiophen-3yl) prop-2-en-1-one: A DFT, Hirshfeld Surface, NCI-RDG, and Molecular Docking Study

Sabrina Smati[1], Boukabcha Nourdine[1,2], Hammou Kheira[1], Karima Menad[1], and Abdelkader Chouaih[1]

[1] Laboratory of technology and solid proprieties LTPS, Abdelhamid Ibn Badis University of Mostaganem,27000, Algeria

[2] University Hassiba Benbouali Chlef, 02000, Algeria

sabrina.smati.etu@univ-mosta.dz

Abstract. Chalcones, including (E)-3-(2-chlorophenyl)-1-(2,5-dichlorothiophen-3yl) prop-2-en-1-one, are recognized for their diverse pharmacological activities. These compounds exhibit significant anticancer, anti-inflammatory, antimicrobial, antioxidant, antidiabetic, and neuroprotective properties. The unique structural features of this chalcone, such as the presence of chlorine atoms and a thiophene ring, may enhance its therapeutic potential by improving efficacy and selectivity towards specific biological targets. Consequently, (E)-3-(2-chlorophenyl)-1-(2,5-dichlorothiophen-3yl) prop-2-en-1-one holds promise for drug development and warrants further investigation through molecular docking and biological assays to fully uncover its pharmacological mechanisms [1].

In this theoretical study, we investigate the molecular geometry, intermolecular interactions, and potential biological activity of (E)-3-(2-chlorophenyl)-1-(2,5-dichlorothiophen-3yl) prop-2-en-1-one. Geometrical analysis was conducted using density functional theory (DFT) with the B3LYP functional and the 6-311G(d,p) basis set to determine bond lengths, bond angles, and torsion angles, providing a detailed understanding of the molecule's structural configuration. Hirshfeld surface analysis was performed using Crystal Explorer to explore intermolecular interactions and crystal packing effects, revealing significant contact points and interaction types. Non-covalent interactions (NCI) and reduced density gradient (RDG) analyses were carried out with Multiwfn to visualize and quantify weak interactions within the molecule, contributing to a comprehensive understanding of its stability and reactivity. Molecular docking studies were performed using AutoDock Vina to predict the binding affinity and mode of interaction between the studied compound and various biological targets, highlighting its potential as a therapeutic agent. The results offer valuable insights into the structural and functional properties of (E)-3-(2-chlorophenyl)-1-(2,5-dichlorothiophen-3yl) prop-2-en-1-one, paving the way for further experimental validation and potential pharmaceutical applications.

Keywords: Chalcone Derivatives, DFT, Hirshfeld Surface Analysis, NCI, RDG, Molecular Docking

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Structural and optical properties of La $^{3+}$ doped BaTiO $_3$ powders hydrothermally synthesizede

Dounia Hamdi [1] and Djahida Talantikite-Touati [1]

[1] Laboratoire de Génie de L'environnement (LGE) (Bejaia, Algeria), Faculté de Technologie Bejaia 06000, Algeria, Algeria

dounia.hamdi@univ-bejaia.dz

Abstract. Barium titanate (BaTiO $_3$: BTO) is a semiconductor of perovskite structure with a great material potential mainly due to its wide band gap which is very useful in electronic and optoelectronic applications.
In this work, pure and doped barium titanate (BaTiO 3 : x La) powders with different concentrations of Lanthanum (x= 0, 4, and 6 at. % abreviated as BT, BTL4, and BTL6) were synthesized by the hydrothermal method.
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 BaTiO $_3$, the results showed that all samples crystallized under the cubic structure and allowed the determination of the crystallite size that was in the range of 35.88-40.3 nm.
The band gaps of the samples were determined from the UV-vis absorption and the effect of La $^{3+}$ doping was discussed in this study.

Keywords: Semiconductor material, BaTiO3, Optical properties, Nanotechnology, Lanthanum doing, Hydrothermal synthesis.

Synthesis and Characterization of LDPE/MgO Nanocomposite Films for Enhanced Electrical Insulation Performance

Hamed BOUKHARI [1,2], Kiouas Djihad[1], Ben Koumar Karima[1], Khane Yasmina[1,2]
[1]Science and technology faculty, Ghardaia university, BP 455 Ghardaia 47000, Algérie.
[2] Materials, Energy Systems Technologies and Environment (MESTEL), Ghardaia university, Algeria
hamedboukha@gmail.com

Abstract. In this study, the focus was on the fabrication of a nanocomposite polymer film aimed at enhancing electrical cable insulation properties. The magnesium oxide nanoparticles MgO-Nps were synthesized using an environmentally friendly sol-gel auto-combustion technique with two different plant extracts the Tazia (Asphodelus Tenuifolius) found in Ghardaïa and the sage (Salvia officinalis) found in Blida. The nanocomposite polymer was prepared by blending low density polyethylene LDPE with magnesium oxide nanoparticles to create a new material with improved electrical insulation properties. The composite material underwent several physical and chemical analyses to determine its properties and optimize its performance. The formation of magnesium oxide (MgO) nanoparticles was confirmed, on their size and shape was studied using a scanning electron microscope (SEM), which showed that the nanoparticles were mostly spherical. The energy-

dispersive X-ray (EDX) spectra also supported the formation of MgO nanoparticles. The crystalline nature and sizes of these nanoparticles were analyzed using X-ray diffraction (XRD), which indicated a face-centered cubic structure, with different sizes for the two plants, respectively (30.15 and 59.02) nm. In addition, the polymeric composite film containing magnesium oxide nanoparticles extracted from the Tazia plant was analyzed using scanning electron microscopy. This analysis revealed the morphology of the sample's surface and confirmed the distribution of the particles on the surface of the film, which contributed to improving the electrical insulation properties of the composite. After completing the analysis of the polymeric composite film, several electrical tests were conducted to assess the electrical insulation properties, including the dielectric constant, volumetric resistance, loss factor, and dielectric strength, and the results showed that the performance was good and met expectations.

Key words: MgO-Nps, sage, Tazia, sol-gel auto-combustion, LDPE/MgO nanocomposites, Electrical cable insulation.

The distribution function of the electric micro field of magnetized plasma

Houria Guerrida [1] and Keltoum Chenini [2,*] and Mohammed Tayeb Meftah [2,**]

[1] Laboratoire de Recherche plasmas et physique des surfaces(LRPPS)
[2] MESTEL Laboratory/ Faculty of Sciences and Technology, Université de Ghardaia
* Département d'automatique et électromécanique/Faculté des Sciences et de la technologie, Université de Ghardaia
** Département de Physique, Faculté de Mathématique et Sciences de la Matière, Université de Ouargla

guerridahouria47@gmail.com

Abstract. The spectral lines shapes are a means suited for the diagnosis of hot and dense plasmas.
The analysis of the physical properties of an atomic system within plasma suggests the introduction of the theory of disturbances 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 in the system.Often all the effects of plasma disrupting ions on an atom can be treated as a uniform electric micro field produced by all plasma ions
In the present work, we focus our attention to calculate the distribution function of theelectric micro field of magnetized plasma

Keywords: Plasma, magnetic field, charged particles, distribution, micro field.

DFT study for fundamental physical characteristics of the zinc-blende $Be_xMg_yZn_{1-x-y}O$ alloys.

Seksak Youssef [1] and Moussa Rabah [1] and Khenata Rabah [2]
[1] Physics Department, Physico-Chemistry of Materials and Environment Laboratory, Ziane Achour University of Djelfa, BP 3117, Algeria

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[2] Laboratoire de Physique Quantique de La Matière et de Modélisation Mathématique (LPQ3M), Université deMascara, 29000, Mascara, Algeria

Abstract. In this study, we investigated the structural, electronic, optical, and thermodynamic properties of the zinc blende phase of the $Be_xMg_yZn_{1-x-y}O$ quaternary alloys by using the density functional theory (DFT)-based full potential linearized augmented plane wave (FP-LAPW) approach implemented in the WIEN2k code. The calculations of the lattice constant (a), bulk modulus(B), and first-order pressure derivative (B′) were performed using various approximations WC-GGA, PBE-GGA, and PW-LDA of the exchange-correlation energy. where a nonlinear fluctuation of lattice constants (a_0) and bulk modulus (B) versus of the content (x, y) in $Be_xMg_yZn_{1-x-y}O$ alloys is observed attributed to variability of the atomic radii of the constituent elements leading to the structural distortion versus compositional changes. For electronic and optical properties using the modified Becke-Johnson (TB-mBJ) approximation. findings obtained show that our quaternary alloys are direct ultrawide bandgap semiconductors. This suggests their absorption and emission of light in the ultraviolet range of the spectrum, making them promising candidates for optoelectronic devices. Moreover, optical properties including such dielectric function, refractive index, and loss energy were calculated. Furthermore, we used the quasi-harmonic Debye model for calculating the thermodynamic properties of the quaternary $Be_xMg_yZn_{1-x-y}O$ alloys such as the heat capacity C_V, Debye temperature θ_D, entropy S and Gibbs free energy G. Current findings indicate that these alloys can operate under high temperature and high pressure.

Keywords: Optoelectronics, wide bandgap, $Be_xMg_yZn_{1-x-y}O$, quaternary alloys, DFT.

Preparation of diatomite supported iron ternary magnetic material and enhanced UV-responsive photoactivity and reusability

Walid Rezig [1]and Mohammed Hadjel [2]

[1] Laboratory of Sciences, Technology and Process Engineering LSTPE ; Department of Chemical Engineering ; Faculty of Chemistry ; University of Sciences and the Technology of Oran Mo-hamed Boudiaf USTO-MB ; BP 1505 El M'naoueur Bir El Djir 31000 Oran ; Oran ; Algeria.

[2] Laboratory of Sciences, Technology and Process Engineering LSTPE ; Department of Physi-cal Chemistry ; Faculty of Chemistry ; University of Sciences and the Technology of Oran Mo-hamed Boudiaf USTO-MB ; BP 1505 El M'naoueur Bir El Djir 31000 Oran ; Oran ; Algeria.

walidrzg@gmail.com

Abstract. This study focuses on the characterization a titanium-prepared, ferric diatomite-modified composite as a catalyst, denoted as "TDF". Surface modification methods applied to the titanium-prepared ferric diatomite involved the deposition of $Fe(NO_3)_3.9H_2O$ and TiO_2 Degussa P25 onto raw diatomite. During the $Fe(NO_3)_3.9H_2O$ treatment, surface silica of diatomite and TiO_2 Degussa P25 were partially dissolved in $Fe(NO_3)_3.9H_2O$, as analyzed through x-ray fluorescence (XRF), scanning electron microscopy (SEM), thermogravimetric analysis (TGA), differential scanning calorimetry (DSC), and UV-visible diffuse reflectance spectroscopy (DRS).The surface area of TDF was measured to be 855 m^2/g. Additionally, surface modification increased the point of zero charge (pH_{PZC}) values to 6 for titanium-prepared ferric diatomite modified (TDF), while the band gap energy of TDF was determined to be E_g= 1.1 eV using UV-visible DRS technique. Photodegradation of vat green 03 indanthren textile dye is dependent on pH, with optimal results achieved at pH 10, resulting in 92 % color removal. Moreover, the photodecolorization rate displayed a pseudo-first order kinetic behaviour with respect to dye concentration.

Keywords: Titanium, ferric, diatomite, band gap, dye, photodecolorization.

DFT Investigation of Sodium Gold (III) Fluoride: Unveiling a New Advanced Material for Optoelectronic Applications

Ishak Mebarkia[1]

[1] Quantum Electronics Laboratory, Faculty of Physics, University of Science and Technology Houari Boumediene, B.P. 32, El Alia, Bab Ezzouar, 16111, Algiers, Algeria

ishak.mebarkia@usthb.edu.dz

Abstract. This research delves into the structural and optoelectronic properties of Sodium Gold (III) Fluoride $NaAuF_4$, utilizing ab initio calculations within the framework of density functional theory to evaluate its potential applications. Through the pseudopotential plane wave method, we analyzed the structural parameters of $NaAuF_4$ and found them to match experimental values reported in the literature closely. Our electronic structure analysis indicates that $NaAuF_4$ is a semiconductor with a direct band gap, underscoring its potential for various optoelectronic applications. Furthermore, we investigated the optical properties of $NaAuF_4$, examining the real and imaginary components of the dielectric function, the refractive index, and the absorption coefficient. Our results reveal significant optical absorption in the UV range, suggesting $NaAuF_4$ is a strong candidate for UV photodetectors. This study marks the first comprehensive theoretical exploration of $NaAuF_4$, setting the stage for future experimental work based on our findings.

Keywords: Ab initio calculations, Optoelectronic properties, Semiconductor material, Sodium Gold (III) Fluoride.

Effect of Y addition on the stability and electronic properties of Mg 2 FeH 6 : DFT study

N. MOSTEGHANEMI[1], L. ROUAIGUIA[1], L. RABAHI[1,2] and A. KELLOU[1]

[1]Theoretical Physics and Didactics Laboratory, Faculty of Physics USTHB, BP 32 Bab-Ezzouar Algiers, Algeria

[2] Research Center in Industrial Technologies (CRTI), BP 64, Cheraga, Algiers, Algeria

nmosteghanemi@usthb.dz

Abstract. Magnesium-based hydrides are considered promising materials for hydrogen storage technology due to their abundance and high storage capacity. In this work, the pseudo-potential (PP) method based on density functional theory (DFT) was used to investigate the effects of Y addition on the stability and electronic properties of Mg 2 FeH 6 . The formation enthalpies, structural parameters, partial and total densities of states of the Mg 2 FeH 6 hydride are predicted. The results highlight interesting effects of the Y element on the studied properties.

Keywords: Hydrogen storage, Mg 2 FeH 6 hydrides, electronic properties, DFT calculations.

Synthesis and Characterization of chemically Crosslinked pH-Sensitive Hydrogel and their appli-cation in controlled release of Diclofenac Sodium

WahibaCHAIBI [1, 2], Sabrina Nour El HoudaFILALI[3], RekiaHananeBOUCHERBA[3] and Kaddour GUEMRA[3]

[1]Faculty of sciences and technology, University of Belhadj Bouchaib , BP 284, Ain Temouchent 46000, Algeria
[2] Centre de Recherche Scientifique et Technique en Analyses Physico-chimiques, BP 384, Zone Industrielle Bou-Ismail, RP 42004 Tipaza, Algeria.

[3]Physical and Organic Macromolecular Chemistry Laboratory (LCOPM), Faculty of Exact Sciences, University "DjillaliLiabes", BP 89, Sidi Bel Abbes, Algeria

wahiba_chaibi@yahoo.fr

Abstract. The objective of the work involves the synthesis of Polyacrylamide (AAm) and poly(acrylamide-co-acid acrylic) (poly(AAm-co-AAc)) hydrogels by solution free radical polymerization initiated by Potassium persulfate initiator (KPS) at different feed mol monomer ratios and N,N-methylene bisacrylamide (BIS) as a crosslinking agent. The obtained hydrogelswere characterized by FTIR, scanning electron microscopy (SEM) and swelling behavior. The swelling properties of poly (AAm-co-AAc) hydrogels were studied in distilled water at different pH. The effect of temperature on swelling behavior of poly(AAm-co-AAc)hydrogels were investigated by variation from 25 to 50°C. The ability of this co-polymeric hydrogels for use in controlled release of model drugs such as diclofenac sodium (DS) was also studied.

Keywords: Poly(acrylamide-co-acid acrylic); swelling; controlled release; hydrogel, diclofenac sodium .

Laser-Accelerated Beams

Djemai Bara∗[1], Lydia Boumedine[2], Ikram Lamri[3], Dounia Toumi[3], and El Hadj Dahi∗†[1,4]

[1]Centre de D´eveloppement des Technologies Avanc´ees – Algeria
[2]Universit´e Farhat Abbas S´etif 1 – Algeria
[3]Universit´e Saˆad Dahlab Blida 1 – Algeria
[4]Centre de Lutte Contre le Cancer-Tlemcen – Algeria

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Abstract. In the field of High Energy Femtosecond Laser Accelerated Particle Beams for Medical Applications (HEFLAPB-MA), numerous physical phenomena significantly influence the different stages of the acceleration process, impacting the quality of the accelerated beams.

This study focuses on characterizing the maximum gained energy, particle count, and dose distribution in HEFLAPB-MA, considering the interplay between suprathermality and relativistic effects of energetic electrons. These phenomena arise in the accelerating plasma due to the strong nonlinearity induced by intense laser fields.

By optimizing the laser, target, and plasma parameters, we demonstrate that the presence of combined relativistic and suprathermal electrons can ensure a stable beam with a highquality energy spectrum and dose distribution. The findings from this characterization and optimization are valuable for researchers studying the transport of energetic electrons in plasma and target environments in HEFLAPB-MA, offering insights for improving beam stability and effectiveness in medical applications.

Keywords: HEFLAPB, MA, relativistic electrons, suprathermality phenomenon, TNSA regime,

energetic electrons transport.

Effect of Changing the Deposition Angle on The Growth Behavior and Topography of the Ti Film Deposited Over a Large Area Using DC Magnetron Sputtering with a Rectangular Target

Ayachi Omar Ali [1], Ayachi Amar Abdelouahed [2] and Ayachi Amar Chaima [1]

[1] Kasdi Merbah University, Ouargla, Algeria 30000
[2] Hassiba Ben Bouali University, Chlef, Algeria 02000
ayachiomar.ali@univ-ouargla.dz

Abstract. When using deposition processes, it might be difficult to generate a homogenous layer with the desired surface characteristics. If the film is not consistently deposited or has appropriate surface roughness, it may fail to meet performance requirements. To better understand and regulate the elements that influence the deposition process, this work proposes a modeling approach for predicting the growth behavior of a Ti-film deposited on substrates during argon ion bombardment of the target at low pressure. The simulation of the deposition process consists of several Monte Carlo simulations, which include predicting the source of the atoms flow from the target surface and tracing their trajectories through the vacuum chamber until they fall or reach the surface of the substrates, then predicting the thickness distribution and topography. After comparing computer predictions to experimental data, it was discovered that the measurements acquired with the Profilometer, Scanning Electron Microscope, and Atomic Force Microscopy were rather close. The results show that as the substrate moves during deposition, the deposition angles shift from perpendicular to parallel, resulting in a thinner, more uniform, and less rough coating. The proposed approach can be utilized to improve the design of magnetron sputtering systems, as well as to provide theoretical guidance for optimizing the thickness distribution and topographical characteristics of high-quality film performance criteria without regard to cost.

Keywords: Plasma, Magnetron Sputtering, Film Deposition, Film Thickness, Surface Roughness.

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Effect of ZrO_2 doped $CuCo_2O_4$ on the optical and electrical properties

Abdelmalek Kharroubi[1], Hadj Benhebal [2], Bedhiaf Benrabah[1],Touati Mohamed[1],Hiereche Khaoula[1], Khiali Aboulkacem[1] ,Serrai Yamina[1]

[1] Laboratory of Physical Engineering Faculty of Mater Sciences, University of Tiaret, Algeria
[2] Department of Chemical, Faculty of Mater Sciences, University of Tiaret, Algeria

abdelmalek.kharroubi@univ-tiaret.dz

Abstract. Undoped and ZrO_2-doped $CuCo_2O_4$ films were prepared using the Sol-gel process and deposited using the dip-coating technique. Optical and electric properties of synthesized materials were characterized by Ultra violet–visible spectroscopy, complex impedance spectroscopy. All films exhibited high transmittance in the visible range above 90% and the optical band gap (Eg) Decrease from undoped $CuCo_2O_4$ 1.83 eV to 1.76 eV for ZrO_2-doped 9% $CuCo_2O_4$ sample which is in agreement with the introduction of electronic levels in the forbidden band of the material.The impedance measurements show that the equivalent circuit of the samples is an R_pC_p where C_p is the capacitance of the layer and Rp its resistance. We note that the resistance of the films decrease varies between 67,4 Ω for undoped $CuCo_2O_4$ to 60,3 Ω , while the capacitance increases reaching between (4.64 nm and 5.07 nm).

Keywords: Thin films**,** spinel, doping, dip-coating, $CuCo_2O_4$

The Impact of Relativistic and Suprathermal Phenomena on the Quality of Structural and optical properties of Eu^{3+} in a novel unconventional glass incorporating Sb_2O_3

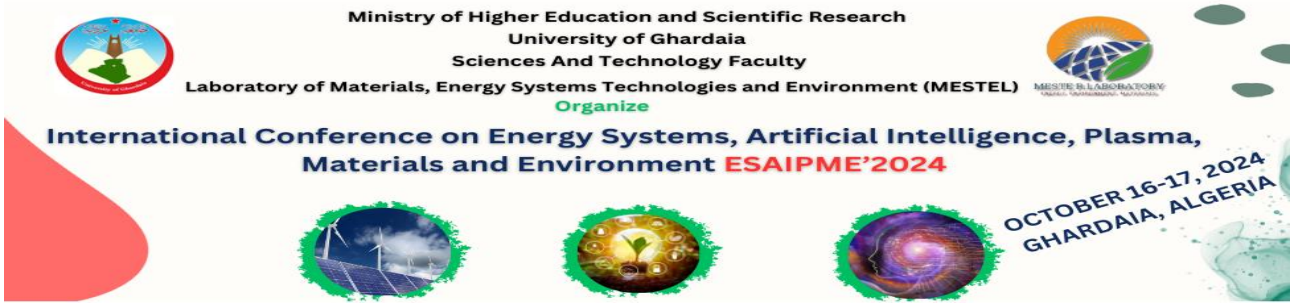
Benhouria Basma[1], Mohamed Toufik Soltani[1], and Seghire Joumana[1]

[1] Department of Material Sciences, Mohamed Kheidar Biskra University, Biskra 07000, Algeria

basma.benhouria@univ-biskra.dz

Abstract. Glass in the chemical composition Sb_2O_3-$20K_2O$-$40WO_3$ doped with 0.5 (mol.%) Eu_2O_3 has been synthesized using the melt quenching method. Several technical characterizations have been implemented to the yellow wish color glass. UV- Vis absorption spectra has used scanned on polished parallel sample glass using Perkin Elmer Lambda 450 spectrometer.IR edge and FTIR spectra have been measured with Perkin Elmer spectrophotometer. Based on these findings, the glasses investigated show promise as suitable options for optical devices. The sample's structure was examined using Fourier Transform Infrared (FT-IR) Spectroscopy, revealing a network structure primarily composed of W=O or W-O, υ_2-WO_3, υ_2-Sb_2O_3, and υ_4-Sb_2O_3 Units.

Keywords: Glass, Antimony, Tungsten oxide, Doping, FTIR spectra.



Barium Gold Bismuthide: A Sustainable Material for Next-Generation Thermoelectrics

A. Khatar [1], B. Bouadjemi[1], M.Houari [1,2] , M. Matougui[1] ,A.Messaoudi[1] ,T. Lantri[a1,2] , A.Zitouni[1] , H. Bentahar[1], ,S. Bentata[1]

[1] Laboratory of Technology and of Solids Properties, Abdelhamid Ibn Badis University, Mostaganem 27000, Algeria
[2]University of Relizane 48000, Relizane, Algeria

abdelhak.khatar.etu@univ-mosta.dz

Abstract. The field of thermoelectric materials (TE); the term "thermoelectric" refers to the interaction between heat and electricity. Therefore, we define thermoelectric materials as materials that can directly convert electrical energy into thermal energy and vice versa. TE compounds have gained attention over the past decade for their ability to address the growing energy crisis caused by a lack of sustainable resources and other environmental concerns, as they may be able to solve production problems in power and cooling technologies. Thermoelectric (TE) materials are of great interest for their ability to convert wasted thermal energy into usable electrical energy. In recent decades, researchers have developed various methods to improve the performance of TE materials, which are characterized by a fundamental factor, the figure of merit ZT (dimensionless). The discovery that numerous half-metallic compounds possess thermoelectric potential served as the driving force behind our decision to employ the semi-classical theory of Boltzmann, specifically the continuous relaxation time approximation (CRTA), as implemented in the BoltzTraP code, to calculate the thermoelectric properties of these compounds. The current study utilized the FP-LAPW method within the Wien2k code, employing DFT and GGA (PBE) and mBJ approximations, to conduct self-consistent ab-initio calculations. Our focus was to investigate the structural, electronic, and thermoelectric properties of the full-Heusler compound Ba_2AuBi. Based on the electronic properties, we found that the full Heusler Ba_2AuBi alloy exhibits a semiconductor behavior with indirect band gap using GGA-PBE and mBJ-GGA approximations. The remarkable thermoelectric properties of Ba_2AuBi, are indicated by these research findings. Specifically, at room temperature, the compound exhibits a remarkably high Seebeck coefficient, as well as high electrical conductivity and a figure of merit close to one. These exceptional values of the merit factor (ZT) and Seebeck coefficient (S) place Ba_2AuBi as a highly promising contender for various thermoelectric applications.

Keywords: Full Heusler, Seebeck coefficient, figure of merit, indirect band gap.

A new additive material is engineered to boost both efficiency and performance in cement manufacturing process

Boukhamla Yousra[1], Nettour Djamel[1, 2], Chettibi Mohamed[2], Derrardjia Nesrine[1] and Aichouri Imene[1]

[1] National Higher School of Technology and Engineering, Mining Engineering, Metallurgy and Materials (G3M) department, 23005, Annaba, Algeria
[2] Badji Mokhtar Annaba University, Faculty of Earth Sciences, Mining Department., 23000, Annaba, Algeria
[2] Laboratory of Mining Resources Processing and environment "LAVAMINE"

y.boukhamla@etu.ensti-annaba.dz

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Abstract. The abstract should summarize the contents and research findings in short terms, i.e. 200-300 words; justified between the margins and using the font/size specified below. Djebel Onk phosphate deposit Situated in the Tebessa province, eastern of Algeria, it serves as a crucial hub for phosphate extraction, vital for fertilizer and agricultural chemical production. The Djebel Onk mining complex generates significant quantities of tailings, stored on-site. This waste poses dual challenges: economic loss and environmental risk, underscoring the importance of sustainable management practices in mining operations.Our research investigates the processing of sludges discarded during the wet screening process of phosphate ore, and evaluates the resulting products via X-ray fluorescence spectroscopy. Granulometry composition and chemical analyses indicate that the fine fraction (<45 µm) possesses a limited P_2O_5 content, rendering it economically unfeasible. Nevertheless, this fraction harbors noteworthy levels of elements like CaO, MgO, and SiO_2, commonly found in limestone and blast furnace slag. The discovery indicates potential for utilizing this material as a cement additive, thus repurposing waste generated at Djebel Onk. This exploration of alternative applications not only mitigates environmental impact but also reclaims economic value. By addressing waste management challenges, fostering sustainable mining practices, and endorsing the circular economy. This approach transforms waste into valuable resources, paving the way towards a more sustainable future in the region.

Keywords: Djebel Onk Deposit; Phosphate Ore; Tailings; Sludge; Cement.

Study of polyene sequences evolution in thermally aged rigid Poly (Vinyl Chloride)

Zineb. Hadj amar[1], Salem fouad. Chabira[1], Mohamed. Sebaa[1]

[11] Mechanics Laboratory (lme), University of Amar Telidji, Ghardaïa Road, B.P. 37G, 3000, Laghouat, Algeria

z.hadjamar@lagh-univ.dz

Abstract. Samples of rigid (u-PVC) tube exposed to 60 °C close of the ground temperature in Sub-Sahara region (Ghardaïa, Algeria) during (0, 30, 60 and 90 days) were transformed into films by casting solution. The final (u-PVC) film samples were analysed by UV-Visible and FTIR spectroscopy in order to follow the reaction occurring during the thermal aging protocol, the behavior of (u-PVC) and stabilizer system subjected to aging factors.
It seems that, the trienes concentration increased during the first 30 days of aging, this coincides with increasing the absorbance of monomeric stearic acid, the main product of HCl-scavanging reaction that followed the zip-elimination, and leads to the consumption of a significant amount of stabilizer.
The decrease in hydroperoxides and the formation of conjugated ketones during the first 30 days are due to the chain scission reaction occurring only during this period.
After the first 30 days, the trienes concentration shows a slight decrease, but increases again in the last 30 days to double the initial value, which in conjunction with the decrease of monomeric stearic acid absorbance, may indicate that the stabilization mechanism changed to the Frye-Host mechanism.

Keywords: (u-PVC) film, thermal aging, polyenes concentration, monomeric stearic acid, conjugated ketones.

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Reliability Improvement of Shear Ram Preventer

Kopei Bohdan[1], Bellaouar Abderrahmane[2] and Vasyl Mykhailiuk [3]

[1,3] Ivano-Frankivsk National Technical University of Oil and Gas, Karpatska str.,15, Ivano-Frankivsk 76019, Ukraine
[2] MESTEL Laboratory,University of Ghardaia, Scientific Zone, BP 455,Ghardaia 47000, Algeria

kopeyb@ukr.net

Abstract. During of an unexpected increase in the storm while drilling the well at sea or in other emergency cases, the drill or casing columns are cut off with cutters of ram blade preventers and seal the well. the drill string remains in the well and it is kept by the pipe rams of the preventer. shear blind rams are rams fitted with a cutting blade, which cut the pipes in the well, allowing thus rams to seal the well. the task was to improve the cross-cutting rams of the preventer in order to increase the effi-ciency of the drill pipe cutting. the proposed modernization of the cutter design allows to complete-ly cut the drill pipe. in it, as in the previous design, the cutting process is the same, but due to the shape of the cutting surfaces there is no pipe bending, but a complete cutting. however, the differ-ence between these structures from existing is that in the process of cutting the pipe first, its point of deformation (puncture) occurs with a cutter. this, in contrast to other designs, it reduces the load at the initial moment of the tube deformation on the hydraulic cylinders of the preventer, and there-fore, the energy costs for this cutting process are reduced, and the load on other elements of the drive is reduced by the preventers. to study the cutting process of a drill pipe, a three-dimensional model of the pipe itself and two rams were constructed. the three-dimensional model is created simplified. the results obtained by the simulation model show the effectiveness of the cutting of the drill pipe and the possibility of complete closure of the preventer.

Keywords: Drill Pipe Deformation, Finite Element Method, Preventer, Shear Blades, Shear Ram

An Evaluation of the Impact of High Temperatures on Mechanical Behavior of Gas Turbine Blade with Different Materials

Khalid Faiza[1], Faris Aissaoui[2], Rabah Manaa[3], Amar Rouag[4], Raouia ZEKKOUR[3]

[1]Center of Research in Mechanics (CRM), University of Constantine1, Algeria.
[2]Department of Automatics and Electromechanics, University of Ghardaia, Algeria.
[3]Laboratory of Research in Production (LRP), University of Batna 2 Algeria.
[4]Department of Renewable Energy, University of Kasdi Merbah Ouargla, Algeria.

Khalid0663@gmail.com

Abstract. The blades of a gas turbine operate under extreme conditions, facing not only high temperatures but also significant centrifugal tensile stresses. These operating conditions impose substantial demands on the materials used in blade construction. The temperature at the turbine inlet is a critical factor, as it directly influences the material properties. Typically, as temperature increases, materials experience a reduction in hardness and strength, leading to greater susceptibility to deformation and potential failure under load. This paper investigates the impact of

temperature on the mechanical behavior of gas turbine blades through numerical analysis using Ansys software. The study focuses on evaluating strain, and total displacement of blades subjected to varying temperatures. A range of materials were analyzed to identify how different substances perform under thermal stress. These materials include, hastelloy X, Inconel 718, Nimonic Alloy 80A, Inconel 625, N155, and a composite material reinforced with mast. The results of the numerical analysis reveal that the composite material rein-forced with mast demonstrates the most favorable performance in terms of stress reduction and displacement management at elevated temperatures. This superior performance suggests that the composite material reinforced with mast is highly effective in maintaining structural integrity under extreme operating conditions, making it a strong candidate for high-temperature applications in gas turbines. The findings contribute valuable insights into material selection for enhancing the reli-ability and efficiency of gas turbine blades in demanding environments.

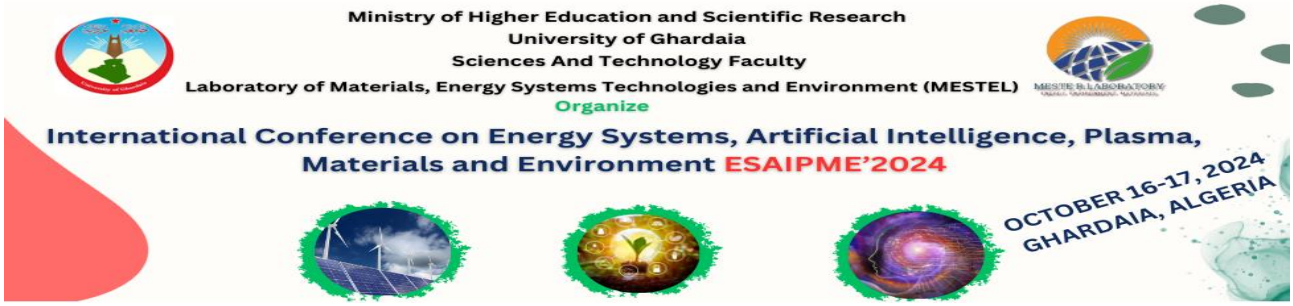
Keywords: Blade, Temperature, Mechanical Behavior, Composite Materials, Mast, Total Displacement, Von Mises Stress, Strain.

Thermal Buckling Characteristics SWBNNT Embedded in Pasternak Elastic Foundation using NFSDT Theory

Mohammed Lamine BOUCHAREB[1] and Abdelwahed SEMMAH[1,2]
[1]Laboratory of Modeling and Simulation Multi-Scale, University of Sidi Bel Abbés, 22000 Sidi Bel Abbés, ALGERIA.
[2]Department of Physics, University of Relizane, Relizane, BP 48000, ALGERIA
laminebouchareb95@gmail.com

Abstract. This work employs nonlocal first-order shear deformation theory (n-FSDT) to examine the critical buckling temperature of a single-walled boron nitride nanotube (SWBNNT) resting on a Pasternak foundation. This model incorporates both small-scale effects and transverse shear deformation effects of the nanotubes. It is assumed that a chemical bond is formed between the SWBNNT and the Pasternak foundation, and the equilibrium equations are derived and solved for the BNNT integrated into the elastic Pasternak medium. The significance of the Pasternak medium lies in its inclusion of a second parameter that accounts for the presence of shear stress within the elastic medium. The results obtained are compared with those reported in the literature. It is evident that the effects of the nonlocal parameter, mode numbers, aspect ratio of the length to the diameter of the BNNT, the elastic medium represented by the parameter kw, and the parameter kp are important and must be considered in this type of analysis. The findings reported in this paper can aid researchers and designers in developing nanodevices that incorporate the thermal buckling properties of boron nitride nanotubes.

Keywords: critical buckling temperature, single walled boron nitride nanotube, nonlocal parameter, first-order shear deformation theory, Pasternak foundation.



Analytical study of the structural stabilities, phase transition, electronic and elastic properties of gallium antimony and gallium phosphide

N. Louati[1], F. Oumelez[1], O. Nemiri[1], D. Boujaadar[2], S. Chebouki[1], W. Gouassmia[1]

[1]Laboratory of Physical Chemistry and Biology of Materials, Department of physics, Institute, Higher Normal School of Technological Education of Skikda, Algeria
[2]Department of physics, Institute, LRPCSI-University of auguest 20th 1955 Skikda, Algeria

gn_louati@esi.dz

Abstract. In the scope of this abstract study, the structural stabilities, phase transitions, electronic and elastic characteristics are evaluated for gallium antimony and gallium phosphide through the density functional theory (DFT). Our calculations were conducted using the WIEN2k incorporating the FP-LAPW. The generalized gradient approximation within Wu–Cohen (WC-GGA) scheme is adopted for structural and elastic properties. The electronic properties performed using the Tran-Blaha modified Becke-Johnson (TB-mBJ) potential and improved mBJ by D. Koller et al also the previous approximation WC-GGA, as exchange correlation functional. We investigated the ZB and RS structural phase to identify the stable structure and to determine the structural parameters (lattice parameter and bulk modulus), then analyzed the transition between these phases due to hydrostatic pressure. For electronic properties, we have demonstrated the semiconductor nature of the said compounds; the elastic properties are also interpreted and analyzed. Our findings align well with both theoretical predictions and experimental data.

Keywords: DFT; Structural parameters; KTB-mBJ; elastic constants

DSC and TGA Analysis of Thermal and Electrical Ag-ing of HV 60 kV XLPE Insulation

A. Smaida[1], Y. Mecheri[1], S. Bouazabia[1],L. Boukezzi[2]
[1] LSEI Laboratory, USTHB Algiers 16000, Algeria
[2] Materials Science and Informatics Laboratory, MSIL, University of Djelfa Djelfa 17000, Algeria
smaida.abdelhay@yahoo.com

Abstract. This paper is an attempt to evaluate thermal and thermogravimetric parameters of cross-linked polyethylene (XLPE) under thermal and electrical aging. Potential characterization techniques were used such as differential scanning calorimetry (DSC) and thermogravometric analysis (TGA). The induced degradation by both kinds of aging was determined by evaluating many physicochemical properties. DSC analysis was used to assess the induced modifications under both kinds of aging on the maximum melting temperature (T_m), the enthalpy of fusion ΔH_m, the lamellar thickness (L) and the crystallinity degree (χ). While the thermal stability of XLPE and its weight loss at high temperature was evaluated by TGA analysis. The obtained results showed that thermal and thermogravimetric properties are affected significantly by thermal aging than electrical one. The effect of thermal aging is harmful especially at temperatures above the XLPE melting temperature. The main cause of this significant effect is the thermo-

oxidative reactions affecting the amourphous and crystalline parts of the material. From the electrical aging results, one can admit that thermal and thermogravimetric properties of XLPE are less sensitive to electric field.

Keywords: XLPE, thermal aging, electrical aging, DSC, TGA, Crystallinity.

Mechanical Properties of Peroxide XLPE HV Insulation Under Cyclic Accelerated Weathering Aging

S. Afeissa[1], L. Boukezzi[1], L. Bessissa[1] and A. Loucif[2]

[1] Materials Science and Informatics Laboratory, MSIL, University of Djelfa, Algeria
[2] ENICAB, Industrial Zone, Biskra, Algeria
Princeton University, Princeton NJ 08544, USA

sadiasouq@gmail.com

Abstract. Crosslinked polyethylene (XLPE) materials are widely used cable insulation materials, it can also be used in the photovoltaic systems connection cables because its resistance to the weathering conditions. In this study, the alterations of mechanical properties of XLPE was evaluated exposed to weathering aging to assess the degradation process, where, a long-term cyclic accelerated weathering aging in the QUV equipment was conducting the evaluation process has been based on industrially methods (tensile test and hot set test). The results show that XLPE material does not present a good stability and does not preserve its mechanical properties during exposed to long aging time.

Keywords: XLPE, weathering aging, crosslinking, mechanical properties, Hot Set Test

First-Principles Examination of Structural Phases in the Low Spin State of $BiCoO_3$

Salima BOUTICHE[1[1, 2]], Adel TEKILI [2[1, 2]] and Hania DJANI[1[2]]

First Author[1] and Second Author[2]

[1] Laboratoire de Chimie Théorique Computationnelle et Photonique, Faculté de chimie, USTHB, B.P.32 El Alia, Bab Ezzouar, 16111, Alger, Algeria.
[2] Centre de Développement des Technologies Avancées, Cité 20 aout 1956, Baba Hassen, Alger, Algeria.

salimaboutichee@gmail.com

Abstract. The abstract should summarize the contents and research findings in short terms, i.e. 200-300 words; justified between the margins and using the font/size specified below. From first principles calculations, the phase diagram of the non-magnetic state (LS) of $BiCoO_3$ is examined. The dispersion curves of the phonons of the cubic

phase are analyzed to identify all possible unstable modes and to evaluate the energy gain of the resulting distorted phases.

The results reveal the presence of similar phases in the states (LS) and high spin (HS), including ferroelectric distortions and octahedral rotations. However, the relative energy order of these phases differs significantly between the two states. In particular, the energy gain due to the condensation of modes is significantly less pronounced in the case LS compared to the state HS. Furthermore, it is identified that the common Pnma phase is the fundamental state of the $BiCoO_3$ LS state, closely followed by the Imma octahedral rotation phase and the R3c ferroelectric phase, thus different from the P4mm ferroelectrical fundamental state (HS) of the state.

Keywords: Perovskite, Magnetism, Ferroelectricity.

Contact pressure between two surfaces

Toufik BOUSNANE[1]

[1] Ghardaia University, BP 455 Ghardaia 47000, Algeria
bousnane.toufik@univ-ghardaia.edu.dz

Abstract. The bone–cement interface has been recognized as a key factor in the failure of cemented total hip arthroplasty (THA). It plays a crucial role in the long-term stability and durability of prosthetic implants after surgery. This study aims to investigate the impact of cement penetration into the bone on the damage occurring at the interface. While previous research has primarily focused on damage accumulation within the cement mantle with varying levels of cement penetration, this study examines the integrity of the bone–cement interface under different mechanical conditions. The results indicate that debonding predominantly occurs in the proximal and medial zones of the interface. The adhesion between the bone and cement is mainly influenced by the extent of cement penetration into the bone.

Keywords: Interface integrity, Cemented total hip arthroplasty (THA), Finite element analysis, Cement penetration.

Synthesis and Photoluminescence of SnO_2: Sb Thin Films

Halima Habieb and Nasr-Eddine Hamdadou

Laboratoire de Micro et de Nanophysique (LaMiN), Ecole Nationale Polytechnique d'Oran Maurice Audin (ENPO-MA), BP 1523 El Mnaouer, Oran 31000, Algérie

habieb.halima@gmail.com

Abstract. In the present work, we have successfully deposited Sb antimony doped tin dioxide (SnO_2) thin films with different concentrations (0 at%, 1 at%, 3 at% and 5 at%) from a stannous (II) chloride dihydrate solution ($SnCl_2.2H_2O$), by the pyrolysis chemical spray deposition technique on ordinary microscope glass substrates preheated to a fixed temperature of 350 °C. After deposition, the films were annealed at 400°C for 4h. The structural, and optical properties of the prepared tin oxide thin films were investigated by stylus surface profilometer to measure the thickness and the roughness of samples, grazing incidence X-ray Diffraction (GIXD), UV-Visible spectrophotometer and photoluminescence measurements (PL). The experimental results obtained by profilometry made it possible to measure the thickness of our samples and to verify that the thin layers of SnO_2 are very smooth and homogeneous. GIXRD diagrams with grazing incidence angle ($\theta = 5°$) and according to ICDD card N°: 00-41-1445 show that the films deposited at various Sb concentrations are polycrystalline with a tetragonal rutile type structure and preferred

orientation direction along [110]. The effect of annealing temperature was clearly seen from the GIXRD diagrams: the improvement of crystallinity and the development of the structure. It has been also noted that the grain size changes between 11 nm and 25 nm. The optical characterization shows that the maximum value of transmittance of 82 % was found for SnO_2: 1 at.% Sb thin films were annealed at 400°C for 4 hours and the optical band gap values range from 3.994 eV to 4.224 eV of SnO_2 films. Room-temperature photoluminescence measurements under excitation at 325 nm show broad emission peak, Photoluminescence (PL) properties influenced by antimony doping for the SnO_2 films are investigated.

Keywords: Antimony Doped Tin Oxide Thin Films, Spray Pyrolysis, Grazing Incidence X-ray Diffraction (GIXRD), Profilometer, Photoluminescence (PL).

DFT study for fundamental physical characteristics of the zinc-blende BexMgyZn1-x-yO alloys.

Youssef Seksak[(1)], Rabah Moussa[(1)], Rabah Khenata[(2)]

[(1)]Physics Department, Physico-Chemistry of Materials and Environment Laboratory, Ziane Achour University of Djelfa, BP 3117, Algeria.

(2)Laboratoire de Physique Quantique de La Matière et de Modélisation Mathématique (LPQ3M), Université de Mascara, 29000, Mascara, Algeria,

Abstract. In this study, we investigated the structural, electronic, optical, and thermodynamic properties of the zinc blende phase of the $Be_xMg_yZn_{1-x-y}O$ quaternary alloys by using the density functional theory (DFT)-based full potential linearized augmented plane wave (FP-LAPW) approach implemented in the WIEN2k code. The calculations of the lattice constant(a), bulk modulus(B), and first-order pressure derivative (B') were performed using various approximations WC-GGA, PBE-GGA, and PW-LDA of the exchange-correlation energy. where a nonlinear fluctuation of lattice constants (a_0) and bulk modulus (B) versus of the content (x, y) in $Be_xMg_yZn_{1-x-y}O$ alloys is observed attributed to variability of the atomic radii of the constituent elements leading to the structural distortion versus compositional changes. For electronic and optical properties using the modified Becke-Johnson (TB-mBJ) approximation. findings obtained show that our quaternary alloys are direct ultrawide bandgap semiconductors. This suggests their absorption and emission of light in the ultravioletrange of the spectrum, making them promising candidates for optoelectronic devices. Moreover, optical properties including such dielectric function, refractive index, and loss energy were calculated. Furthermore, we used the quasi-harmonic Debye model for calculating the thermodynamic properties of the quaternary $Be_xMg_yZn_{1-x-y}O$ alloys such as the heat capacity C_V, Debye temperature θ_D, entropy S and Gibbs free energy G. Currentfindingsindicate that these alloyscan operate under high temperature and high pressure.

Keywords: Optoelectronics,wide bandgap, $Be_xMg_yZn_{1-x-y}O$, quaternary alloys, DFT.

Synthesis of the semiconductor material from a binary zinc sulfide alloy as a precursor for solar cells

Meriem HAMLA[1] and Samra AMAMRA [2]

[1]Department of Matter Sciences, Faculty of Science and Technology, University Mohamed El Bachir El Ibrahimi of BordjBouArréridj, 34030 El Anceur, Algeria

[2]Energetics and Solid-State Electrochemistry Laboratory (ESEL), Department of Processes Engineering, Faculty of Technology, Ferhat Abbas-Setif1 University, 19000 Sétif,

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GHARDAIA, ALGERIA

Algeria

meriem.hamla@univ-bba.dz
samra.amamra@univ-bba.dz

Abstract. Among the photovoltaic materials of recent interest, one may mention the low-cost and non-toxic chalcogenides, such as ZnS [1] and SnS. Zinc sulfide (ZnS) is a (II-VI) semiconductor compound of major importance; it has a wide direct forbidden band of 3,68 eV [2]. In addition, this material possesses a broad optical transparency ranging from ultraviolet (UV) to infrared (IR) [3]. This optical transparency coupled with the chemical and thermal stability makes ZnS one of the most widely used materials as a window layer in heterojunction photovoltaic solar cells. Zinc sulfide is one of the most important group II-VI optical semiconductor materials.
In this work the synthesis of a binary compound that is used as a precursor in the ZnS-based solar cell. For this, The ZnS films have been electrochemically deposited on ITO substrate from acidic medium (pH 3.5–4.5), containing tri-sodium citrate as complexing agents.
The optical study, conducted within the visible range between 300 and 1100 nm, indicated that the thin films obtained had a band gap energy of 3.90 eV [4-5].Moreover, the scanning electron microscopy (SEM) images showed a homogeneous morphology, with granular surface properties. The energy dispersive spectroscopy (EDS) spectra also confirmed the formation of the ZnS phase.

Keywords: Band gap; zinc sulfide ZnS; Semiconductor; Electrochemical techniques; Photovoltaics.

Ecological synthesis of nanoparticles: an overview on biosynthesis and characterization methods

KHENFER Siham[1*]., MOSBAH Said[1,2]., BOURICHA M'hamed[1].,HAMMOUDI Roukia[1].,BOUDJENAH-HAROUN Saliha[1].

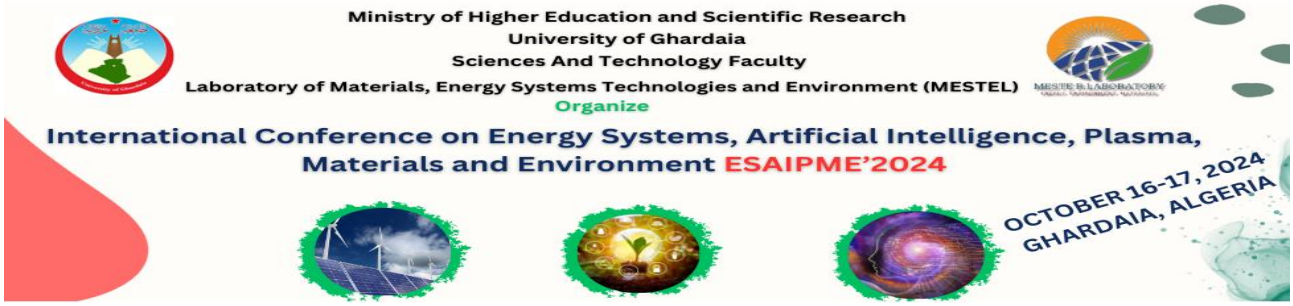
[1]Phoeniculture.Univ. Kasdi Merbah Ouargla, Ouargla 30000, Algérie.
[2]Biogéochimie des milieux désertiques. Univ. Kasdi Merbah Ouargla, Ouargla 30000, Algérie.

*khenfer.siham@univ-ouargla.dz

Abstract. Nanotechnology is the major dynamic research area of recent materials science. Nanoparticles reveal new or improved properties based on detailed descriptions such as size, morphology and distribution. There have been remarkable developments in the field of nanotechnology over the last few years. For environmental reasons, the biosynthesis of nanoparticles is preferred. The use of waste, plant extracts, biopolymers, bacteria and fungi is an efficient and environmentally friendly way to synthesize nanoparticles. Biosynthesis is a simple and easy method of using biological resources. This methodseemspromisingcompared to the chemicalmethod.

Today, organic production of nanoparticles has recently been attracting interest because of their prospect of synthesizing nanoparticles that are environmentally friendly. Generally speaking, nanoparticles are synthesized by following two dominant approaches: the first is the bottom-up approach and the second is the top-down approach. The objective of this research is to study different methods of nanoparticle biosynthesis and their characterization.

Keywords: Nanoparticles, Biosynthesis, Plant extract, Bacteria, Environment.



Physicochemical characterization of biocomposite based films plasticized with glycerol/DL-lactic acid mixture

Djalila AOUFI [1, 2,*], Nabila BELLOUL[2], Khadoudja LAOUBI[2], and Fayrouz BENHAOUA[3]

1. Research Center In Industrial Technologies -CRTI- EChahid Mohammed ABASSI Cheraga, Algiers; Algeria.
2. Laboratory of Coatings, Materials and Environment, M'Hamed Bougara University, Boumerdes, Algeria.
3. Research Unit: Materials, Processes and Environment, M'Hamed Bougara University, Boumerdes, Algeria.

*aoufidjalila@yahoo.com.

Abstract. The purpose of the present study is the development, and the characterization of biocomposite films obtained from a mixture of cornstarch/microcrystalline cellulose and the evaluation of the influence of a plasticizers mixture (glycerol/DL-lactic acid) on the physicochemical properties (FTIR, Light transmission, water sorption isotherm, water vapor permeability, thermogravimetry and mechanical test) of these films. These films have been characterized in order to use them as new formulations to produce films for food packaging. The obtained films are generally homogeneous, opaque, thin, smooth and having a good coherence with no visual defects. A binary mixtureof glycerol andDL-lactic acidhas beenused to combine thefunctionalities of the two plasticizers. Theresults showedthat for the samecontentof the plasticizer, the use of plasticizer mixture show the following advantages: reduction of moisture content,water vaporpermeability values which gives agood preservation of food products. An increasein the flexibilityof films was observed which; is explained by the fact that the plasticizers mixture (glycerol / DL-lactic acid) has a double plasticizing effect: internal plasticization due to the intercalation of polymer substituted chains between the polymer chains and external plasticization due to glycerol molecules. In addition, the hydrogen bonds formed in this new plasticization are more stable than those formed during the use of glycerol or of the DL-lactic acid separately, which is confirmed by FTIR analysis.

Keywords- DL-lactic acid, Glycerol, Starch; Microcrystalline cellulose; Plasticizers mixture

Effects of angular momentum and spin on electron scattering by a hydrogen like atom

Bachir Amieur[1,*], Mohammed TayebMeftah[2], Keltoum Chenini[1,*],
[1]Materials, Energy Systems Technologies and Environment (MESTEL), Université de Ghardaia
[2]Laboratoire de Rayonnement et Plasmas et Physique des Surfaces (LRPPS), UKMO
[*] Département d'automatique et électromécanique/Faculté des Sciences et de la technologie, Université de Ghardaia
amieur.bachir@univ-ghardaia.dz

Ministry of Higher Education and Scientific Research
University of Ghardaia
Sciences And Technology Faculty
Laboratory of Materials, Energy Systems Technologies and Environment (MESTEL)
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Abstract. In the impact theory, the calculation of the broadening of spectral lines needs the computation of the cross sections of the scattering between electrons and the radiant atoms. In the previous works, only the electric interaction has been taken into account.

In this work, we do not neglect the magnetic effect (spin of electrons and angular momentum of atoms). To do this, we have introduced the necessary formalism, and applied it to compute the broadening of Lyman alpha spectral lines of hydrogenoïdes atoms.

Key words: Broadening of spectral lines – Cross section of the scattering -magnetic effects

First-Principles Calculations (FP-LMTO) on Structural and Electronic Properties of compound CaTe

S. DAHO

University of Hassiba Benbouali, Faculty of Technology, Department of mechanical ingineering, Chlef 02000, Algeria2

dahouhbc@gmail.com

Abstract. First-principles calculations are performed to investigate the structural and electronic properties of II-VI compounds, using the full-potential linear muffin-tin orbital (FP-LMTO) method based on the density-functional theory within the (LDA) approximation. The lattice parameters, bulk modulus and their pressure derivatives are calculated, our results are in agreement with others values. Electronic and band structures have been studied, the character of our compounds has been determinate.

Keywords: DFT, FP-LMTO, LDA, GGA, CaTe, CsCl.

Synthesis and characterization of the $LaFeO_3$ perovskite by samarium substitution: $La(1-x)SmxFeO_3$.

CHAKOUR naziha[*1], BASSAID Salah [*], DEHBI Abdelkader [*], OULDHAMADOUCHE Nadir *, and BELGUENOUNE ahmed[*]

[*] Engineering Physics Laboratory University of Tiaret – Algeria

[1] naziha.chakour@univ-tiaret.dz

Abstract. Thanks to their interesting properties, perovskites are used in various fields, including in the fields of catalysis, energy and the environment.
In our study we synthesized the LaFeO3 phase using the solid-state reaction synthesis method. And we studied the effect of replacing La+3 with Sm+3 on the structural properties of the Ferrite La1-x $SmxFeO_3$ oxide series (with x = 0, 0.025, 0.05, 0.10 and 0.15).
Structural analysis by X-ray diffraction DRX and Rietveld refinement by LFO substitution by samarium $La(1-x)SmxFeO_3$ show that the LSFO sample is well crystallized in a perovskite structure of orthorhombic system with the Pnma space group. And the structural parameters and the crystallite size of these ferrites were affected by the substitution of lanthan with samarium.

Keywords. Perovskite, $LaFeO_3$,LSFO, solid state and $La(1-x)SmxFeO_3$

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Adsorption of anionic dye by intercalated montmorillonite

Houria Rezala[1] and Amaya Romero[2]

[1] Université Djilali Bounaama de Khemis-Miliana, Faculté des Sciences et de la Technologie, Route de Thenia El Had, 44001 Khemis-Miliana, Algérie
[2] Departamento de Ingenieria Quimica, Facultad de Quimicas, Universidad de Castilla-la Mancha, Campus Universitario s/n, 13004 Ciudad Real, Spain

h.rezala@univ-dbkm.dz

Abstract. Methyl orange (MO) is an anionic dye which is extensively used in manufacturing printing paper, research laboratories, and textile industries. It can cause harmful effects such as diarrhoea, increased heart rate, cyanosis, vomiting, and tissue necrosis in human beings [1, 2]. MO has light stability and low biodegradability thus difficult to remove from aqueous solutions by common water purification/treatment methods. Among all methods, adsorption has become the most desirable technique because of its benefits like low cost, ease of operation, simplicity of design, and insensitivity to toxic pollutants [2]. The main objective of the present study was to investigate the adsorption of MO by CTAB-Mt or CTAB-Al-Mt. To the best of our knowledge, there is no report on the application of CTAB or both CTAB and Al 13 modified nano-sized montmorillonite for removing MO from aqueous media. The resulting materials have been characterized by X-ray fluorescence spectrometry, X-ray diffraction, Fourier transform infrared spectroscopy and nitrogen adsorption-desorption at 77 K. The effect of different parameters such as contact time, solution pH, adsorbent dose and initial dye concentration on the adsorption phenomena have been investigated by batch adsorption experiments. The maximum removal efficiency of MO has been found in acidic medium and with 60 min equilibrium time., 100 mg/L initial MO concentration and 1 g/L adsorbent dosage.

Keywords: Adsorption, Isotherm models, Kinetic models, Anionic dye, Intercalated Montmorillonite.

Treatment of Fluoride Contamination from Water Environment Using Eggshells Waste as an Affordable Alternative Adsorbent

Ayachi Amor Asma[1] , Messaitfa Amar[1] , Tabchouche Ahmed[2] , Souad Zighmi[1] , Said bachir[2] and Fatma Zohra Ayachi Amor[3]

[1] Engineering Laboratory of Water and Environment in Middle Saharan, University Kasdi Merbah Ouargla, 30000 Ouargla
[2] Laboratory of Dynamic Interactions and Reactivity of Systems, University of Kasdi Merbah, 30000 Ouargla, Algeria
3 Applied Sciences Faculty, Process Engineering Laboratory, Ouargla University, Ouargla 30000, Algeria.

aychiomar12@gmail.com ayachiomar.asma@univ-ouargla.dz

Abstract. Fluorosis illness is a quiet pandemic in southern Algeria that produces a variety of dental and bone abnormalities. The primary cause of this pandemic is long-term intake of fluoridated water and agricultural goods. If it is surpassed, the WHO sets a fluoride ion concentration of 1.5 mg/l. This study tries to reduce the proportion of fluoride ions in drinking water. Eggshells were employed as an adsorbent during fluoride adsorption. The eggshells were broken and sieved into three particle sizes (125, 500, and 1000µm) then heated at various temperatures (378 K). XRD, FT-IR, pHpzc, SEM, and TG/DTA analysis

were utilized to characterize the adsorbents. Adsorption batch tests were performed to investigate the adsorption capacity of eggshell powder. Examples include particle size, preparation temperature, contact duration, and adsorbent dosage.
The efficacy of fluoride removal was assessed using a UV-VIS spectrophotometer. Eggshell powder heated at 373 K with 250µm particle size was determined to be the most effective adsorbent, with a maximum fluoride removal efficiency of 55.3%, a maximum adsorption capacity of 0.062mg/g, and a residual fluoride concentration of 1.07mg/L within 160 minutes. The adsorption kinetic data on eggshells calcined at 378 K were effectively fitted with the pseudo-second-order model, resulting in a satisfactory coefficient of determination (R 2 =0.994). A tow g adsorbent dosage and 1 hour of contact time were adequate to reduce fluoride levels from 2 to 1.08 mg/l. shows that the procedure is effective discovered that the optimal approach for treating water from the Ouargla region which has a high population element fluoride. The fact that this procedure is non-toxic and less costly is another benefit.

Keywords: Eggshells Waste, Fluorosis, Defluoridation, Adsorption, Green Solution.

Treatment of Water Polluted, using the Adsorption by Activated Carbon Prepared from Local Date Pits

Abdelkader Guemgam[1]

[1] University of Amar Thelidji of Laghouat, B.P 37G, Laghouat 03000, Algeria

aek.guemgam@lagh-univ.dz

Abstract. This work is based on the study of the adsorption process of an organic pollutant by activated carbon prepared from date pits. With it, two goals can be achieved two objectives: the elimination of agricultural waste and on the other hand the recovery of these materials. The optimization of operating parameters, which is obtained by carrying in a laboratory the batch adsorption process (the mass of the biosorbent, the initial concentration of solution, the initial pH, and the contact time) to obtain a good ability to remove methylene blue dye from aqueous solutions, helps to predict the adsorption process in a large industrial scale. In light of the result obtained experimentally, the appropriate factors (mass 0.05 g of adsorbent, 100 mg/L solution, pH 5.7 during 120 min) for adsorption capacity of 83.35 %.

Keywords: Adsorption, Activated carbon, Date pits, Water pollution.

Removal of phenol and methylene blue from water using activated carbon prepared from date palm fibers

Bentarfa Djehad [1*], Sekirifa Mohamed Lamine [2]

[1,2] *Faculté des Mathématiques et des Sciences de la Matière, Laboratoire de Biogéochimie en Milieux Désertiques, Université Kasdi Merbah Ouargla, BP 511, 30000 Ouargla, Algeria. Et Centre de Recherche Scientifique et Technique en Analyses Physico-Chimiques*

[*]*(djehadbentarfa@gmail.com*

Abstract **–** There are large areas with large quantities of palm trees in Ouargla resulting in a significant amount of date palm fibers, On the other side, With Industrial Development We get a big problem which is Environmental Pollution our Objectives are: Reducing the

huge amount of date palm fibers, Preparation of adsorbents with cheap material, Environment protection. This study was carried out in two stages: The first concerns the production of activated carbon from date palm fibers by physical activation with carbon dioxide (CO_2) an activation agent. The second concerns the removal of phenol and methylene blue from water using activated carbon. Date palm fibers are suitable for the preparation of successfully activated carbon with excellent surface area and best properties, it can be effectively utilized as a raw material for ACF production. We find as a result that The maximum adsorption capacity of phenol and MB onto ACF's was observed for ACF_3 11.96, and 2.82 $mg.g^{-1}$ respectively, the difference in this value for these adsorbents and the smaller specific surface area (166.29 $m2.g^{-1}$) and higher pores diameter (2.11 nm) explains the higher adsorption capacities of phenol and MB for ACF_3 compared to the other ACs. The samples showed that the highest percentage of adsorption was at low phenol and MB concentrations.

Keywords – activated carbon, date palm fibers, adsorption, phenol, methylene.

Enhanced activation of Calcium peroxide by the Fe(III)-picolinic acid complex under UV A irradiation for metobromuron degradation

Sellam Badreddine[1], Seraghni Nassira[1] and Sehili Tahar[1]

[1] Department of Chemistry, Laboratory of Environmental Sciences and Technologies, University Constantine 1, Constantine, 25000, Algeria.

badro.sellam@gmail.com

Abstract. The photo-Fenton process is considered one of the most efficient of advanced oxidation for the mineralization of organic materials, as it combines the traditional Fenton reaction with the use of light. However, the main disadvantage of this method lies in the necessity of operating in a pH range (2-4), in addition to the short lifespan and instability of H_2O_2 at a neutral medium. To overcome these drawbacks, researchers have used solid peroxides like MgO_2 , ZnO_2 , and CaO_2 as alternatives to liquid H_2O_2 . These solid compounds offer advantages such as stability, ease of storage, and transportation. Among them, CaO_2 stands out due to its environmentally friendly nature and potent oxidizing power. To address the issue of iron precipitation, chelates have been used to form stable complexes with Fe(III), preventing iron precipitation in neutral medium. Moreover, these complexes enhance UV and visible light absorption, allowing for the utilization of a wider portion of the solar spectrum and reducing operational costs. In this study, picolinic acid was used as a chelating agent for iron ions to solve the problem of the traditionally narrow pH range and precipitation of iron ions in the traditional technology. Building upon these advancements, we have developed an Fe(III)-picolinic/CaO_2/UV_A system for the removal of organic pollutants from water, using metobromuron as a model contaminant. This research focuses on enhancing calcium peroxide activation by the Fe(III)-picolinic complex under UV_A irradiationto degrade metobromuron.The photodegradation of metobromuron in the Fe(III)-picolinic/CaO_2/UV_A system was studied, and the efficiency of photodegradation was evaluated under different operating conditions, such as theconcentration of the Fe(III)-picolinic complex, the dose of CaO_2 , and the pH level. The main reactive oxygen species were also identified. The results confirmed that this system is highly effective in treating water contaminated with metobromuron.

Keywords: Metobromuron, calcium peroxide, Ferric ion, Fe(III)-picolinic acid, photodegradation

Decolorization of the azo dye Orange G by the Fe (III)-EDDS/persulfate/UV_A process in aqueous medium: reaction kinetics and mechanism.

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Awatef Dali[1] , Mohamed El Hadi Benssassi[2] and Tahar Sehili[1]

[1] Laboratoire des Sciences et Technologies de l'Environnement (LSTE), Faculté des Sciences Exactes, Université des Frères Mentouri Constantine 1, 25000, Constantine, Algeria. dali.awatef@umc.edu.dz
[2] Département de Chimie, Faculté des Sciences, Université 20 août 1955-Skikda, Algeria.Email : dali.awatef@umc.edu.dz, mohamedelhadi.benssassi@umc.edu.dz, tsehili@yahoo.fr

dali.awatef@umc.edu.dz

Abstract. Organic dyes, particularly azo dyes, are widely used in various industries. However, they pose major processing problems because they are difficult to eliminate using conventional methods. In recent years, advanced oxidation processes based on sulfate radicals (POA-RS) have received considerable attention due to their efficacy in disinfection and decontamination. In the present work, the decolorization of the azo dye Orange G (OG) in aqueous solutions bythe persulfate (PS)/Fe(III)-EDDS process under UV A irradiation was studied.Approximately 97.6% of the OG was decolorized in 15 min of reaction with a pseudo-first order rate constant value (k) of 0.309 min -1 under optimum conditions ([PS] 0 = 2.5 mM, [Fe(III)-EDDS] 0 = 0.2 mM, and [OG] 0 = 0.025 mM at initial free pH). Increasing the initial concentration of a complex or oxidant can significantly accelerate OG decolorization, but increasing their concentrations in excess can lead to an inhibitory effect due to their ability to scavenge reactive radicals. The maximum rate of disappearance was obtained at an acid pH. It has also shown significant decolorization efficiencies even at near-neutral pH. According to the radical scavenging results, sulfate radicals are the main species for pollutant removal. The environmental application of the Fe(III)-EDDS/PS/UV A system was also taken into account, and showing that the process is capable of removing other organic pollutants such as cresol red, malachite green, and metronidazole. Our study revealed that the activation of persulfate by the Fe(III)-EDDS complex is more environmentally friendly and can therefore be applied to the elimination of organic dyes generated by industry.

Keywords: Persulfate, Fe(III)-EDDS, Orange G, Sulfate radical.

Essais de traitement des lixiviats des dechets menagers de la ville de Mostaganem (ouest Algerie) par evaporation forcee

Guermoud Noreddine[1]*, Terkhi Mohammed Cherif[1]and Benderdouche Nouredine[2]

[1] Departement Sciences et Techniques, Université de Mostaganem, Algérie
[2] Département de Génie des Procédés, Université de Mostaganem, Algérie

guermoud27000@yahoo.fr

Résumé. L'objectif de cette étude est la mise au point d'une technique d'évaporation pour le traitement des lixiviats des déchets ménagers de la ville de Mostaganem afin d'éviter le rejet définitif dans la nature. Plusieurs modèles ont été testés, et ceci en fonction de plusieurs paramètres tels que, la position des bacs d'évaporation par rapport au sol, la couverture des bacs d'évaporation par des plaques de verre et leur angle d'inclinaison et la présence ou l'absence de systèmes d'agitation et de ventilation. Les essais ont permis de mettre au point un modèle définitif d'évaporation forcée avec des plaques de verre inclinées avec un système d'agitation du lixiviat. Les essais d'évaporation forcée du lixiviat ont permis de réduire le temps d'évaporation du lixiviat d'environ 50 % par rapport à l'évaporation naturelle et de 30 % par rapport à l'évaporation avec des plaques de verre horizontales. La vitesse d'évaporation est passée d'une valeur de 4,08 mm/jour à une valeur de 12,25 mm/jour pendant la période estivale. Le modèle développé montre la performance et l'efficacité de traitement des lixiviats par évaporation forcée, ce qui confirme que cette technique reste une alternative pour le traitement des lixiviats.

Mots-Clés : Mostaganem, déchets ménagers, lixiviat, traitement, évaporation forcée.

Effect of microwave irradiation time on the preparation of a porous material from vegetable waste

Renad Rabie[1], Ahmed Belgacem[1], Hocine Hadoun[2] and Fatma Djema[2]

[1] Transfer phenomena laboratory USTHB, Babezouar, Algiers, Algeria.
[2] Algiers nuclear research center CRNA, Algiers, Algeria.

renadrabie@gmail.com

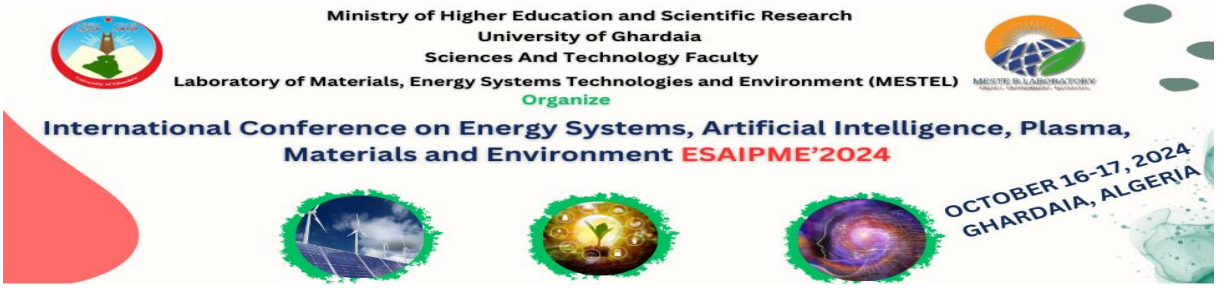
Abstract. In this study, we synthesised an activated carbon from vegetable waste using a microwave oven, varying its irradiation time to assess its impact on the final material. The aim is to apply our optimal material to the adsorption of organic dyes in solution, as part of water treatment, in order to help preserve the environment. To this end, we chose chemical activation by orthophosphoric acid H_3PO_4 at a precise concentration and mass impregnation rate, followed by carbonisation in a microwave oven under an inert atmosphere at a fixed power of 500W and at different residence times (2, 5, 7 and 10min). The samples obtained were washed to neutral pH, then dried in an oven at 105°C for 24 hours. They were then characterised by X-ray diffraction (XRD), Fourier transform infrared spectroscopy (FT-IR) and methylene blue index. FTIR analyses revealed that the materials obtained are rich in oxygenated functions such as hydroxyl groups (OH), ether groups (C-O-C) and carbonyl groups (C=O). These functions can influence the chemical and physico-chemical properties of the material, as well as its interactions with other organic and inorganic substances. The optimum methylene blue index (MBI), determined by UV-visible analysis, is 615.36 mg/g, corresponding to 7 minutes of irradiation. The MBI reflects the adsorption capacity of medium-sized molecules and is used to evaluate mesopores and macropores. Such a high value indicates that the material has a high affinity for certain chemical compounds, suggesting a high adsorption capacity. These results have enabled us to evaluate the effect of microwave irradiation time on the synthesis of our porous material and to demonstrate that our activated carbon obtained from lignocellulosic biomass can be used effectively in various applications linked to the purification and separation of undesirable substances in water, in particular organic dyes.

Keywords: Activated Carbon, Microwave, Irradiation Time, Preparation, Biomass.

Synthesis and characterization of novel Keggin-type polyoxometalate nanocatalysts for Congo red degradation

S. Boudjema[1] *, F. Louri[2], F. Chelgham[2], A. Choukchou-Braham[1]

1. Laboratoire de Catalyse et Synthèse en Chimie Organique, Faculté des Sciences, Université de Tlemcen, Algeria.
2. Laboratoire De Valorisation et Promotion des Ressources Sahariennes, Université Kasdi Merbah,Ouargla- 30000, Algeria.



*boudjemaa.souhila@gmail.com

***Abstract*—**To improve the photocatalytic efficiency of TiO_2-based nanomaterials, we demonstrate a facile, generalized, highly localized reduction approach to the decoration of Novel Keggin-type polyoxometalate nanocatalysts based Ag and Zr metal nanoparticles. The synthesis of nanocomposite photococatalysts reported in this study has been achieved by utilizing the unique ability of the TiO_2-bound and PTA (phosphotungstic acid) molecules (a polyoxometalate, POM) to act as a highly localized UV-switchable reducing agent that specifically reduces metal ions to their nanoparticulate forms directly and only onto the TiO_2 surface. This leads to the metal contaminant-free synthesis of TiPW and AgPW metal nanocomposites, which is a significant advantage of the proposed approach. The study further demonstrates that polyoxometalates are regenerable photoactive molecules with outstanding electron-transfer ability and the deposition of metal nanoparticles on the TiO_2PTA catalytic surface can have a dramatic effect on increasing the overall photocatalytic performance of the composite system. Moreover, it is observed that the photococatalytic performance of the AgPW, AgPW@ZrO_2, TiPW and TiPW@ZrO_2 metal nanoparticles can be fine tuned by choosing the composition of metal nanoparticles in the nanocomposite. Interestingly, the photocatalysts reported here are found to be active under visible. The underlying reaction mechanism for photocatalysis has been proposed**.**

***Keywords*—** Polyoxometalates, nanomaterial, Titanium, Congo Red, Degradation.

Kinetics of Removal of a Cationic Dye by Activated Carbon Based on Nut Shells

Halima Delali[1], Zohra Bahnes[2], Aicha Medjdoub[3],Abir Benhadda[4], Khedidja Dahmani[5], Mohammed Amin Chemrak[6] Nawel Moussa[7], Asmae Benabbou[4], Iman Gouaich[4] and Mostefa Belhakem[4]

[1] Department of Science and Nature and Life (SNV), Abdelhamid Ibn Badis University, Mostaganem
[2] Ecole Normale Supérieure (ENS), Mostaganem
[3] Department of Process Engineering (GP), Abdelhamid Ibn Badis University, Mostaganem
[4] Laboratory of Structure, Elaboration and Application of Molecular Materials (SEA2M) at Abdelhamid Ibn Badis University, Mostaganem
[5] Department of Process Engineering (GP), University of Relizane
[6] Department of Science and Technology (ST), University of Tissemsilt
[7] Department of Science and Technology (ST), Abdelhamid Ibn Badis University, Mostaganem

Abstract. Our study aims to valorize a waste material by transforming it into activated carbon for use in the removal of a cationic dye. We began by characterizing the surface of the activated carbon through Fourier-transform infrared pectroscopy. The analysis revealed the presence of oxygenated groups on the surface of the carbon. The study of factors (time, dose, and pH) showed that the best removal rates were obtained with an adsorbate/adsorbent contact time of 3 hours, a biosorbent dose of 2 g/L, and an acidic dye solution. The kinetic study revealed that the pseudo-second-order model best describes the adsorption kinetics of the dye by our activated carbon.

Keywords: adsorption, activated carbon, cationic dye.

Washing of TPH contaminated soil using SLES solution on afluidization column

Mohammed Aouf[1]

[1] Université de Ghardaia, Process Engineering department

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University of Ghardaia
Sciences And Technology Faculty
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Aouf.mohammed@univ-ghardaia.edu.dz

Abstract. This study presents a remediation method for the contaminated soils with total petroleum hydrocarbons (TPH) using fluidization as a washing technique. an artificially contaminated soil was weathered for a year then tested for TPH content (23490 mg/kg). The effects of time, operation mode, surfactant concentration, and temperature on TPH removal were investigated and mathematically modeled. The Results revealed a fast desorption kinetic for the first couple of minutes, while the presence of surfactant hid the temperature impact on TPH removal. The working/stopping operation mode improved the washing efficiency. A mathematical model was generated using the found results helping to predict the optimal operation conditions, finally, a TPH removal ratio of up to 99% was obtained.

Keywords: Soil washing, contamination, fluidization, TPH.

Sustainable Dye Removal Using Jujube Stone-Based Activated Carbon

Mounir Daoud [1, 2] and Zoubida Kecira [2]

[1] Faculté des sciences et technologies, Université de Ghardaia, Ghardaia, Algeria
[2] Laboratory of Physical and Chemical Study of Materials and Applications in the Environment, Faculty of Chemistry, USTHB, BP 32 EL-Alia, 16111 Bab Ezzouar, Algiers, Algeria

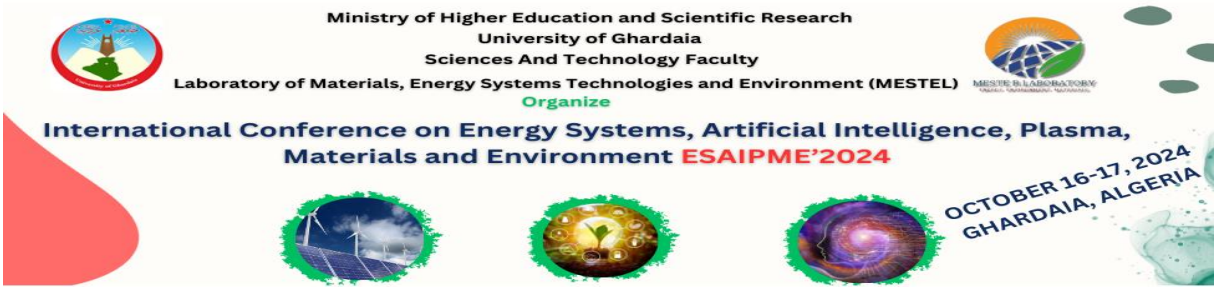
daoud.mounir@univ-ghardaia.dz

Abstract. In this study, activated carbon was developed from jujube stones (JSAC) and used for the removal of the reactive dye BEZAKTIV Yellow S-MAX (YRSM) from aqueous solutions through a batch adsorption method. The activated carbon was produced via a dry activation process, involving the impregnation of dried biomass with H_3PO_4 at a ratio of 1:3 (w/w), followed by carbonization at 500°C under nitrogen (N_2). JSAC was characterized using BET surface area analysis, SEM, and Boehm titration. Notably, JSAC exhibited a high specific surface area of 1896 m^2/g. The study also investigated the effects of contact time, solution temperature, and pH on YRSM dye adsorption. Adsorption isotherms were evaluated using Langmuir, Freundlich, and Temkin models, with the Langmuir model providing the best fit. The adsorption capacity was determined to be 95 mg/g. Kinetic analyses were conducted using pseudo-first-order, pseudo-second-order, Elovich, and intra-particle diffusion models.

Keywords: Jujube stones, Activated carbon, Valorization, Adsorption, Textile dye removal.

Catalytic Converters for Automotive Exhaust Gas Treatment: Construction, Operation and Types of Catalysts

Kahina Bedda[1]



[1] Department of Chemical and Pharmaceutical Process Engineering, Faculty of Hydrocarbons and Chemistry, M'Hamed Bougara University of Boumerdes, Boumerdes, 35000 – Algeria
k.bedda@univ-boumerdes.dz

Abstract. Automotive exhaust emissions contain pollutants such as HC, CO, SOx, NOx and Particulate Matter (PM) which have very harmful effects on the environment and human health. To avoid these problems and preserve air quality, many regulations around the world limit the emissions of pollutants released into the atmosphere by the road vehicles. Therefore, various techniques have been used to comply with emission standards like hydrotreating of petroleum fractions, use of fuel additives, exhaust gas recirculation (EGR), improvement in engine design and combustion process as well as the installation of catalytic converters in exhaust systems. A catalytic converter is an exhaust emission control device that converts toxic gases and pollutants into less hazardous products through redox reactions. In the present study, the construction and operation of catalytic converters have been described in detail. The catalytic converter consists of the following parts: the catalyst support, the washcoat and the catalyst. According to their mode of operation, catalytic converters are classified into three categories: two-way converters, three-way converters and four-way converters. There are different types of catalysts used in catalytic converters, namely metal catalysts, perovskite, monel, spinels and hopcalite. However, noble metal catalysts are the most commonly used in automotive catalytic converters. Particular attention has been paid in this study to recent advances in the development of catalysts for automotive exhaust pollution control and to the perspectives for improving the performance of these catalysts.

Keywords: Air Pollution, Automotive Emissions, Catalytic Converters, Noble Metal Catalysts, Nanocatalysts.

Computational analysis of new half Heusler material for waste heat recycling process: an environmentally friendly energy resource

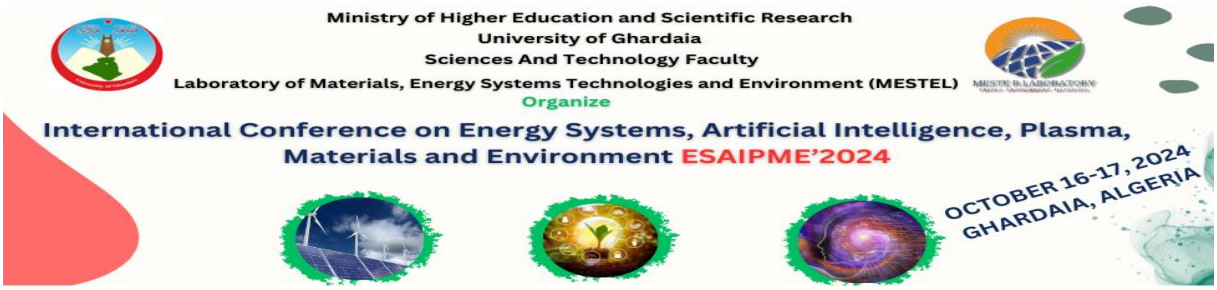
Yassmine Bouldiab*[1,2] and Sabria Terkhi[1]

[1] Laboratory of Technology and Solid's Properties, Faculty of Sciences and Technology, Abdelhamid Ibn Badis University, B.O 227, 27000
[2] Faculty of Exact and Applied Sciences, department of chemistry, university of Oran1

*Bouldiab.yasmine@yahoo.com

Abstract. This study investigates the structural, elastic, electronic, magnetic and thermoelectric properties of the FeVSn half-Heusler (HH) alloy [1] using density functional theory (DFT) and the full potentiallinearized augmented plane wave (FP-LAPW) method [2], which is implemented in the WIEN2k code[3]. The exchange correlation potential is evaluated using two different approaches: GGA) [4] and GGAplus modified Tran and Blaha Becke-Johnson potential plus Hubbard parameter (mBJ-GGA+U).Analysis of the total energy as a function of volume reveals that RbCrSi adopts a type 1 ferromagnetic configuration. Negative values for cohesion and formation energies indicate the synthesizability andstability of HH RbCrSi. Elastic results show that RbCrSi is anisotropic and ductile. Magneto-electronic results reveal that the RbCrSi compound exhibits a half-metallic nature with a total integer magneticmoment of 1.00μB, in agreement with the Slater-Pauling rule. Thermoelectric properties areinvestigated by the BoltzTrap code [5]. The ZT figure merit which reaches ~1 at 300 K, highlights the potential of half-Heusler studied as a new class of prospective thermoelectric material. As a result, RbCrSi alloy will be beneficial for thermoelectric device applications and environmentally-friendly technologies.

Keywords: half-Heusler (HH), thermoelectric properties, figure of merit, WIEN2k, FP-LAPW method.



Heterogeneous Fenton process for the degradation of an azo dye: Methyl orange using iron modified dolomite as a catalyst.

Bellaouar Asma [1], Ali Boukhemkhem [1], Nacira Bellaouar [2], Samir Hameurlaine [3], Molina Carmen Bellen [4]

[1] Laboratory Interactions Materials-Environment (LIME), University of Jijel, 18000 Jijel, Algeria
[2] Biogeochemistry Laboratory of Desertic Environment, Kasdi Merbah Ouargla University, 30000, Ouargla, Algeria
[3] Centre de Recherche Scientifique et Technique en Analyses Physico-Chimiques (CRAPC)-PTAPC, Biskra, Algeria
[4] Chemical Engineering Department, Faculty of Sciences, Universidad Autónoma de Madrid, 28049, Cantoblanco Madrid, Spain

asmabellaouar47@gmail.com

Abstract. Dyes present a significant challenge in wastewater management due to their toxicity and low biodegradability. To address this issue, advanced oxidation processes (AOPs) have become essential to industrial wastewater treatment, particularly for the effective removal of textile dyes. This study investigates the degradation of methyl orange dye (MO) through a heterogeneous Fenton process using iron-modified dolomite as a catalyst. XRD analysis was conducted on both the unmodified and modified dolomite samples, confirming the preservation of the dolomite structure. Furthermore, examination of the reaction parameters highlighted the significant impact of temperature and catalyst dosage on decolorization efficiency. The catalyst demonstrated notable stability and excellent performance even after four consecutive cycles, suggesting its potential for reuse. This research underscores the promising application of iron-modified dolomite as an efficient catalyst for the degradation of methyl orange dye.

Keywords: Dolomite, Methyl orange, Fenton process, Dye.

Application of ZnFe-LDH layered double hydroxide and calcination product for adsorptive removal of anionic dye from aqueous solution: thermodynamic study and modeling

Fatima BOUCIF[1]✉, Fatiha BESSAHA[2], Nora MAHREZ[3], Gania BESSAHA[4], Amine KHELIFA[5]

[1] Université Abdelhamid Ibn Badis, Département des Sciences et Technologie, Mostaganem-ALGERIE
[1,2,3,4,5] Laboratoire de Structure, Élaboration et Applications des Matériaux Moléculaires, Université Abdelhamid Ibn Badis, Mostaganem, ALGERIE

✉ boucif78@yahoo.fr

Abstract. Adsorption is recognized as one of the most promising technologies applied to remove various pollutants from contaminated water.

Ministry of Higher Education and Scientific Research
University of Ghardaia
Sciences And Technology Faculty
Laboratory of Materials, Energy Systems Technologies and Environment (MESTEL)
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Layered double hydroxides (LDHs) can be considered an encouraging material to eliminate inorganic and organic pollutants from aquatic media owing to their high porosity, high ion exchange ability, abundant interlayer anions, and positively-charged layers .

We were interested in the synthesis of layered double hydroxides based on Zn and Fe by coprecipitation at constant pH. The resulting material was calcined at 500°C for 3 hours, and applied to the removal of a Congo red dye in aqueous solution. This study is favored at pH=8 and the equilibrium time was estimated at 2 hours with an initial concentration of 300 mg/L Congo red.

The highest value of adsorption capacity obtained from the Langmuir equation was equal to 480 mg/g for calcined ZnFe LDH. The values of the standard Gibbs free energy (ΔG°), entropy (ΔS°), and enthalpy (ΔH°) obtained for these adsorption processes prove that the adsorption of CR by ZnFe-500 is a spontaneous endothermic process. This work confirms that ZnFe-500 can be selected as favorable sorbents to remove congo red from aqueous solution.

Keywords:layered double hydroxides, contaminants removal, adsorption, dye

Effets des Fibres Végétales (Malva) sur les Propriétés Physico-Mécaniques de la Matrice Cimentaire

YALAOUI Kattia*1, ZEMBOUAI Idris 1 KACI Mustapha1

1 Process Engineering / University Abderrahmane Mira, Bejaia, Algeria

*kattia.yalaoui@univ-bejaia.dz

Abstract. L'Algérie dispose de ressources extraordinaires en fibres végétales, telles que celles de Malva, palmier, d'alpha, de coton, etc. Cependant, leur valorisation dans les domaines pratiques, notamment dans les matériaux de construction, reste encore peu exploitée. L'utilisation des fibres de Malva dans le béton s'est révélée être une solution avantageuse en raison de son abondance et de ses impacts socioéconomiques et environnementaux positifs. L'incorporation des fibres végétales dans le béton présente un avenir prometteur, notamment à cause des problèmes posés par l'utilisation des fibres d'amiante, de carbone et d'acier sur la santé humaine. Ces matériaux synthétiques sont nuisibles et leur remplacement par des alternatives plus sûres et durables est crucial. L'objectif principal de ce travail est d'étudier l'effet de l'incorporation des fibres végétales de (Malva de Bejaia) sur les propriétés mécaniques (résistance à la compression et à la flexion) du mortier renforcé par ces fibres. L'étude se concentre sur l'effet des fibres sur la résistance mécanique du mortier et l'effet du dosage en fibres. Quatre teneurs en fibres ont été testées : 0,5 %, 1 %, 1,5 % et 2 % du poids du ciment. Les résultats indiquent une amélioration de la résistance mécanique du mortier avec des teneurs de 0,5 % et 1 % en fibres. Cependant, pour les autres teneurs (1,5 % et 2 %), l'ajout de fibres à un effet inerte ou négatif sur la résistance mécanique

Keywords : : Fibres végétales (Malva), Matrice cimentaire, Propriétés mécaniques, Matériaux de construction Durabilité

Adsorption of copper from aqueous solutions using adsorbents derived from local agricultural waste

Kessal Abdelkader[1*], Nouioua Asma[2] and Fadel Ammar[1]

[1] Civil Engineering and Hydraulic, Sustainable Development and Environment, University of Biskra, Biskra, 07000, Algeria
[2] Research Laboratory in Subterranean and Surface Hydraulics, University of Biskra, Biskra, 07000, Algeria

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GHARDAIA, ALGERIA

abdelkader.kessal@univ-biskra.dz

Abstract. The removal of heavy metals from wastewater has become a significant challenge in recent years due to their toxicity at low concentrations to humans and ecosystems, as well as the high costs associated with their elimination. The use of agricultural wastes as adsorbents offers a promising solution due to their low preparation cost and wide availability, such as grasses that grow quickly and abundantly. In this study, three adsorbents were prepared from local grass: one pyrolyzed at 800°C (Pyr Ads), another treated by hydrothermal operation followed by pyrolysis at 800°C (Hy Ads), and a third activated with NaOH and then pyrolyzed at 800°C (Act Ads). These adsorbents were characterized using SEM and EDS. A preliminary adsorption test was conducted on a synthetic solution of a heavy metal pollutant (copper), at different concentrations (10, 20, 40, 80 mg/L) at ambient temperature. The removal percentages for 80 mg/L were as follows: Pyr Ads (64.89%), Hy Ads (90.23%), and Act Ads (94.87%). The results suggest that this type of grass shows great potential as a low-cost adsorbent. Further studies are planned to address remaining research questions and enhance the value of this work.

Keywords: Heavy metals, Copper, Adsorption, Agricultural wastes, Wastewater treatment.

A Decision Making Model Based On TOPSIS Method For Evaluating Water Resource Management Strategies

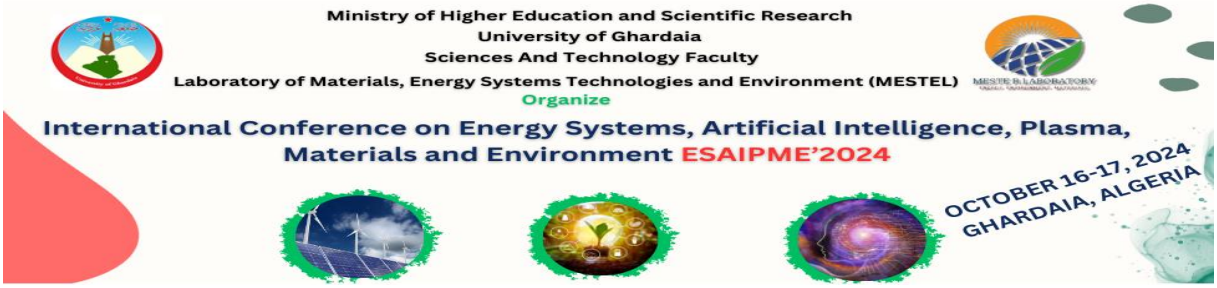
Oufella Sarah[1]

[1] University of Relizane Bourmadia, Relizane, Algeria tamina150@yahoo.fr

sarah.oufella@univ-relizane.dz

Abstract. Water resources play an important role in the sustainable development and are central to all activities of human beings and to the health of the natural ecosystems .Given the challenges posed by chronic water scarcity resulting from global warming, hydrological uncertainty, and extreme weather events (floods and droughts) effective water resource management becomes paramount. Select the best water resource management strategy among a set of candidate strategies is complicated process involving many criteria and factors including environmental, social, political, technological, and economic concerns. Therefore, there is a critical need for rigorous analytical approaches, tools, and systems that can effectively evaluate and choose the right strategy taking into account simultaneously various factors. In this context, multi criteria methodologies can be seen as the most appropriate tool. Multi Criteria Decision Making (MCDM) methods have been widely employed in various practical decision making contexts. Recently, these methods have also found application in areas within water management. The present study focuses on providing an effective solution to the problem of choosing the most suitable water resource management strategy according to a set of conflicting criteria. In this context, the author proposes a decision making support system integrating a multi criteria method to assist decision makers within the water sector in their tasks. The proposed system exploits the advantages offered by TOPSIS (Technique for Order Preference by Similarity to Ideal Solution), a ranking multi criteria method which is frequently used in several application fields due to its simplicity, ease of understanding, and efficient computation.

Keywords: Water resource management strategies, multi criteria analysis, decision support system, TOPSIS method



Depollution of water contaminated by dye through adsorption

Telhas Djihad[1,2], Ines Hamdi[2], Khadidja Bouzid[3], Rehali Hanane[1,2], Sihem Djebabra[2] and Fadia Bekiri[3]

[1] Laboratory of LARGHYDE, University of Biskra BP 145 RP, Biskra 07000, Algeria
[2] Industrial chemistry Department, University of Biskra (07000), Algeria
[3] Scientific and Technical Center Research on Arid Regions, University of Biskra07000, Algeria
djihad.telhas@univ-biskra.dz

Abstract. There is currently more water that is contaminated with different pollutants, such as dyes, heavy metals, and pharmaceutical products, due to the broad use of water across several industries and the expansion in worldwide industrial activity. Dyes are harmful contaminants in wastewater that have become a critical environmental concern. There is an urgent need for effective treatment technologies to address this challenge. Among these, the utilization of adsorption technology on local biowastes has demonstrated significant effectiveness and cost- efficiency. Hence, our research especially focused on the adsorption of water contaminated with dyes, employing plant-derived bio-waste. The activated carbon prepared has proven to be effective in removing the dye from the water.

Keywords: charbon, biomass, pollutants, dyes, adsorption

Innovations in Water Treatment : The Integration of Adsorption Techniques

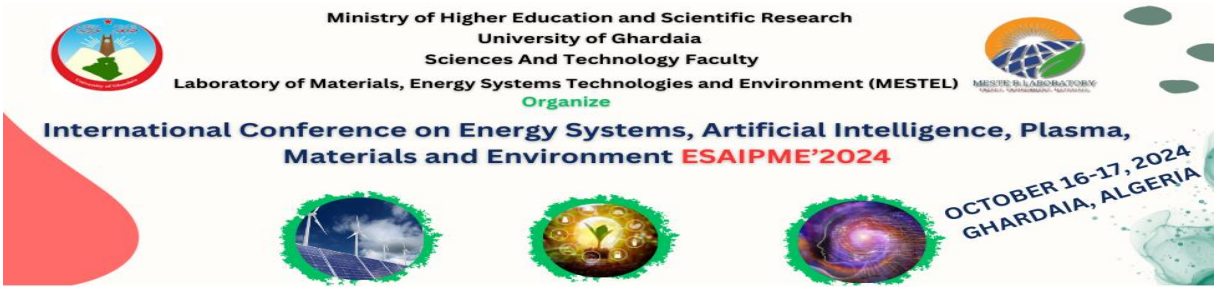
Bendellaa Ramila Chahinez[1] , Amara-Rekkab Afaf[1] , Didi Amel[1] and Boudghene Stambouli Ghizlene[2]

[1] Separation and Purification Technologies Laboratory, University of Abou Bakr Belkaid
[2] inorganic chemistry and environment laboratory, University of Abou Bakr Belkaid

bendellaaramila@gmail.com

Abstract. Adsorption is a promising method for water treatment, particularly for the removal of organic contaminants such as industrial dyes. Casein, a protein derived from milk, was characterized by its zero charge point to optimize the adsorption process. Key experimental parameters, such as contact time and temperature, were investigated to determine their influence on adsorption efficiency. The results showed that adsorption equilibrium was reached after 30 minutes, with a decolorization percentage of 81.24%. The ambient temperature of 25°C was found to be optimal for promoting adsorption of the dye onto the casein. Modeling of experimental data made it possible to characterize the adsorption process. The adsorption of methylene blue onto casein has been shown to be an exothermic and spontaneous process. Furthermore, the adsorption mechanism follows a pseudo-second-order kinetic model, indicating a strong interaction between the dye and the casein surface. This study highlights advances in water treatment by integrating efficient and sustainable adsorption techniques. The use of casein for adsorption of industrial dyes presents a potential solution for water purification, by combining biodegradable materials and energy-efficient processes. These results pave the way for additional research to optimize adsorption conditions and expand the application of this technique to other aqueous contaminants.

Keywords: wastewater, Adsorption, dye, Casein, Kinetic



Evaluation of the Environmental Impact of Wastewater Treatment in Algeria: A Case Study of WWTPs and LTPs

Bouchaala Laid[*1,2], Grara Nedjoud[4], Naib Laila[3], Charchar Nabil[2], Abdel Fetah Gherib[2] and Douh Mourad[2]

[1] Environmental Research Center (CRE), Annaba. Algeria.
[2] Biotechnology Research Center (CRBt). Constantine, Algérie
[3] Environment and sustainable development laboratory (ESDL), department of biological science university of AHMED ZABANA, Relizane, ALGERIA.
[4] Faculty of Natural and Life Sciences and Earth and Universe Sciences, Department of Biology, University of 8 Mai 1945 Guelma, P.O. Box: 401, 24000 Guelma, Algeria

l.bouchaala@cre.dz/mlbouchaala@gmail.com

Abstract. Wastewater management is a crucial issue for environmental protection, particularly in Algeria where anthropogenic pressure on water resources is significant. This study focuses on assessing the effectiveness of biological wastewater treatment in WWTPs (Wastewater Treatment Plants) and LTPs (Lagoon-based Treatment Plants) in Algeria. The study was conducted based on the analysis of data from 108 stations, covering a wide range of treatment technologies. Key physico-chemical parameters were measured to evaluate the effectiveness of treatments and the environmental impact of discharges. The results show that biological wastewater treatment is effective to a certain extent, with higher pollutant reduction rates in WWTPs than in LTPs. However, discharge values still exceed Algerian standards and WHO recommendations, raising concerns about the environmental impact of discharges on aquatic ecosystems. The study highlights the need to strengthen control and monitoring measures for the quality of treated wastewater, particularly for WWTPs and LTPs where performance is less optimal. Innovative solutions and additional investments are needed to improve wastewater treatment efficiency and minimize environmental impact. Environmental protection and the preservation of water resources require sustained efforts for optimal wastewater management. This study provides essential information to improve wastewater treatment practices in Algeria and ensure better protection of aquatic ecosystems.

Keywords: Wastewater treatment, Wastewater treatment plants (WWTPs), Lagoon-based treatment plants (LTPs), Biological treatment, Environmental protection, Algeria.

Renewable Energy Is Gate For Modern Desalination

Mounira Bouabdallah[1,2]

[1] Faculty of Sciences and technology ,Mohamed El Bachir El Ibrahimi University of Bordj Bou Arréridj
[2] Laboratory of Treatment and Formation of Fibrous Polymers, Faculty of Technology, M'hamed Bougara University of Boumerdes,Algeria

mounira.bouabdellah@univ-bba.dz

Abstract. The idea of producing potable water from seawater was conceived in ancient times, when the crews of merchant ships, cruising across the oceans for long periods, met with formidable challenges of water shortage, while oddly enough, being

surrounded by huge amounts of nondrinkable water. This contradiction constituted an incentive for conducting the first experiments that proved that distilled seawater does not carry any salt and is drinkable, and therefore, desalinated. Today's global desalinated water production amounts to about 65.2 million m 3 per day (24 billion m3 per year), equivalent to 0.6% of global water supply. However, desalination is an energy-intensive process and meeting the associated energy requirements from declining conventional sources is a major worldwide challenge. The dominant technology is Reverse Osmosis (RO), which accounts for 60% of the global capacity,followed by Multi Stage Flash (MSF), with a 26.8% share. The larger desalination plants can reach a capacity of up to 800,000 m 3 per day or larger. There is now rapid development towards linkage of desalination processes with renewable energy sources. Renewable technologies that are suited to desalination include solar thermal, solar photovoltaics (PV), wind, and geothermal energy. Solar technologies based on solar heat concentration, notably concentrating solar power (CSP), produce a large amount of heat that is suited to thermal desalination. This will not only reduce the burden on conventional energy sources but will also protect the environment through lower emissions. In reference to the environmental impacts of desalination, these require further investigation and attention in order to achieve water security without increasing environmental externalities. Renewable energy based desalination can help eliminate the carbon emissions of conventional energy supply from the desalination process but there are still other issues such as brine disposal.

Keywords: Desalination, Renewable Energy, Water Scarcity, Water.

Phenotypic diversity of rhizobial isolates associated with peanut (*Arachis hypogaea* L.), grown in the region of Ghardaia

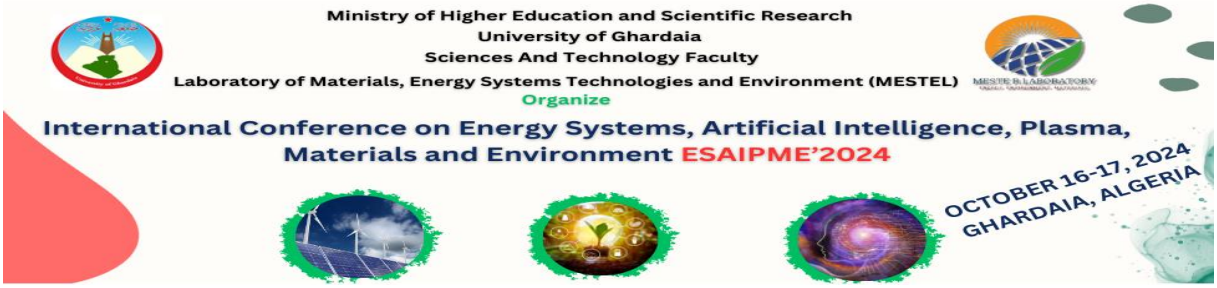
Laouar Bouchra[1,3*], Bendib Fatima Zohra[1] , Kraimat Mohamed[1,2] and Benhammouda Hicham[1]

[1] Département de Biologie, Faculté des Sciences de la Nature et de la Vie, Université de Ghardaia, 47000 Ghardaïa, Algérie
[2] Laboratoire Valorisation et Conservation des écosystèmes arides (LVCEA), Université de Ghardaia, 47000 Ghardaïa, Algérie
[3] Laboratoire des Matériaux, Technologie des Systèmes Énergétiques et Environnement, Université de Ghardaia

laouar.bouchra@univ-ghardaia.dz

Abstract. The present study aimed to isolate as large a number as possible of rhizobial strains from the root nodules of *Arachis hypogaea* L. in order to identify them morphologically and culturally by seeking an enrichment of the bacterial taxonomy of peanut-nodulating rhizobia. Therefore 13 isolates were selected from the nodules of four different regions in the wilaya of Ghardaïa. The isolation was carried out using a medium (YMA). The bacteria isolated are characterized according to their morphological and phenotypic characters, the isolates were thus tested for their PGPR power by studying their capacity to produce siderophores and to solubilize phosphorus. The analysis of their tolerance to salinity, temperatures, acidic and alkaline pH, as well as biochemical analysis have made it possible to demonstrate a wide physiological and biochemical diversity within these rhizospheric bacteria. Most isolates are able to tolerate pHs ranging from 4 to 10, NaCl concentrations from 0.5% to 5%, and temperatures from 4 to 50 ° C. The majority of isolates are found to be oxidase, catalase positive. They are also found to vary between Gram bacilli (negative / positive). Numerical analysis of these phenotypic characteristics shows two large groups with 82% similarity. Based on the traits studied, most of our isolates carry the same phenotypic traits of rhizobia.

Keywords:*Arachis hypogaea* L, Ghardaïa, Rhizobia, Taxonomy, Diversity, PGPR.



Corrosion Inhibition of Medium Carbon Steel in the hydrochloric acid Using Aqueous Extract of *Saussurea costus*

Masouda Farhat[1], Itawel oumrou Taleb amar[2], Sulayman M.Adabu[1], Noaf A.Zidan[1] and Salah Aldeen S.Altahahbau[1]

[1] Sebha University,, Faculty of Engineering, / Libya
[2] Laboratory of Materials Chemistry, Faculty of Science and Technology, University of Nouakchott Al Aasriya (UNA) - Nouakchott - Mauritania.

Mas.Ali @sebhau.edu.ly

Abstract. This study deals with the corrosion inhibition of metal corrosion process of medium carbon steel using 1M HCl, for kinetic studies and rate reaction determination, the weight loss method is applied, extract as *Saussurea costus*, demonstrated that the *Saussurea costus* extract generated a thin protective coating on the metal surface, was found out that *Saussurea costus* inhibited the corrosion of medium steel in the acidic environment, It was discovered that the inhibition efficiency increased as the *Saussurea costus* extract dosages increased .the system's kinetic characteristics and thermodynamic adsorption have also been measured and investigated. The results collected demonstrated that *Saussurea costus* adsorption on metal surfaces, followed the Langmuir isotherm and that the *Saussurea costus* extract operates via physisorption according to the Adsorption Energy($\Delta G°_{ads}$ -38.35), This value showed that the extracts of *Saussurea costus* inhibited the corrosion process through physioso0rption mechanism, the findings of disparate measurements were in good agreemen.

Keywords:*Saussurea costus*, corrosion inhibition; carbon steel; hydrochloric acid; activation energy, Aqueous Extract, weight loss method.

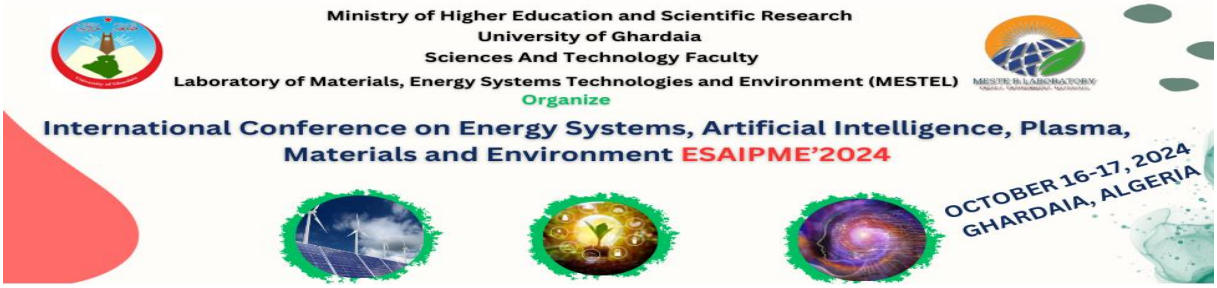
Valorization of lignocellulose as the biosorbent of heavy metal ions from the contaminated water

Zoubida Kouroulou[1], Mahmoud Belalia[1] and Fouad Mekhalef Benhafsa[1,2]

[1] Laboratoire de Structure, Elaboration et Application des Matériaux Moléculaires (SEA2M), Faculté des Sciences et de la Technologie, BP 188, Université Abdelhamid Benbadis, Mostaganem
[2] Centre de Recherche Scientifique et Technique en Analyses Physico-Chimiques CRAPC, BP384, Bou-Ismail, 42004, Tipaza, - Algeria

Abstract. Wastewater treatment remains a critical issue globally till date despite various technological advancements and breakthroughs. Heavy metal in wastewater poses a great threat to human health if untreated properly, which makes its removal of utmost importance. Among various wastewater treatment techniques, adsorption is the most common technique to remove heavy metal in wastewater due to its flexible design, operation, and cost-effectiveness.This work presents the results of the experimental study for adsorption of heavy metal copper from contaminted water using a biosorbent , with the removal efficiencies of about 56%, Finally, lignocelullose adsorbents can be used as promising adsorbents for the remediation of heavy metal from wastewater.

Keywords: environment, adsorption, heavy metal, biosorbent



Optimizing process parameters for adsorption of pharmaceutical contaminant

Akacha Imane[1*], Merzougui Abdelkrim[2] and Bouzid khadidja[3]

[1] Laboratory of LARGHYDE,University of Biskra,Po Box145,07000,Biskra,Algeria
[2] Department of industrial chemistry,University of Biskra,Po 145,07000,Biskra,Algeria
[3] Scientific and Technical Center Research on Arid Regions,University of Biskra,Po Box ,07000, Biskra,Algeria

imane.akacha@univ-biskra.dz

Abstract. The production of medicines has increased significantly in the past few years, which has improved the quality of health for both humans and animals. In the other hand, this considered an environmental issue because Pharmaceuticals originally from human and agricultural effluent often end up in surface water sources. Acetaminophen is commonly used as analgesic. Acetaminophen is a drug which is used for treating headaches, fever, muscle aches and colds.in this study we use the adsorption process to eliminate this drug from aqueous solution. Scanning electron microscopy (SEM), Fourier-transform infrared spectrometer (FTIR) were used to characterize the biochar produced from the pyrolysis of agriculture waste. Its effectiveness in removing this pollutant has been tested by studying some of the factors affecting this process, such as contact time, pH of solution, ionic strength.

Keywords: Adsorption, Pharmaceuticals pollutants, Biochar, FTIR, SEM Removal of Pollutant (dye) from Wastewater using Low-cost Adsorbent

Removal of Pollutant (dye) from Wastewater using Low-cost Adsorbent

Aouatef Driouch[1], Zahira Mohamed Seghir[2], Hakim Aguedal[3], Benzaidi Orkia[1] and Yamina Benmerzouka[1]

[1] Laboratory of Materials Valorization, Department of Process Engineering, Faculty of Science and Technology, Abdelhamid Ibn Badis University - Mostaganem, Algeria.
2 Department of Process Engineering, Faculty of Science and Technology, University of Mostaganem
3Department of Preparatory Classes, Higher School of Saharan Agriculture - Adrar, Algeria.

aouatef.driouch@univ-mosta.dz

Abstract. Because of their industrial use, dyes are major water pollutants. Rhodamine B (RhB) is a widely used dye. It is a member of the xanthene family of dyes used to dye a variety of substances. Rhodamine B's harmful effects on the environment and human health have prompted scientists to consider its elimination from wastewater. Adsorption using non-conventional biomass-based sorbents is the most attractive solution due to its low cost, durability, availability and environmental friendliness. The study began with physicochemical characterizations of the bio-sorbent, such as surface functional groups, pore size distribution and surface area. The adsorption potential of bio-sorbents was also explored, and the influence of parameters such as solution pH, temperature, dye concentration and bio-sorbent dosage were evaluated. It was noted that adsorption was independent of pH. Adsorption data were fitted to Freundlich and Langmuir isotherms and various adsorption parameters were calculated. Thermodynamic parameters such as ΔG°, ΔH° and ΔS° were calculated. The calculated values for heat of adsorption

and free energy indicate that dye adsorption is favored at low temperatures and that the dye is chemisorbed on the biosorbent. Based on the results obtained, it can be concluded that biomass can be used as a low-cost biosorbent for dye removal in water treatment.

Keywords: Dye; Bio-sorbent; wastewater; Adsorption

Synthèse écologique de nanoparticules : aperçu sur des méthodes de biosynthèse et de caractérisation

Khenfer S[1*], Said M[1,2], Bouricha M[1], Hammoudi R[1] and Boudjenah-Haroun S[1]

[1] Phoeniculture. Univ. Kasdi Merbah Ouargla, Ouargla 30000, Algérie.
[2] Biogéochimie des milieux désertiques. Univ. Kasdi Merbah Ouargla, Ouargla 30000, Algérie.

khenfersiham01@gmail.com

Résumé. La nanotechnologie constitue le grand domaine de recherche dynamique de la science des matériaux récents. Les nanoparticules révèlent des propriétés nouvelles ou améliorées sur la base d'une description détaillée telle que la taille, la morphologie et la distribution. Des développements remarquables ont eu lieu dans le domaine de la nanotechnologie au cours des dernières années. Pour des raisons environnementales, la biosynthèse des nanoparticules est privilégiée. L'utilisation de déchets, d'extraits de plantes, de biopolymères, de bactéries et de champignons constitue un moyen efficace et écologique de synthétiser les nanoparticules. La biosynthèse est une méthode simple et facile d'utilisation des ressources biologiques. Cette méthode semble prometteuse par rapport à la méthode chimique. Aujourd'hui, la production biologique de nanoparticules a récemment suscité un intérêt en raison de leur perspective de synthétiser des nanoparticules qui sont respectueuses de l'environnement. D'une manière générale, les nanoparticules sont synthétisées en suivant deux approches dominantes : la première est l'approche ascendante et la seconde est l'approche descendante. L'objectif de ce travail de connaissance est d'étudier différentes méthodes de biosynthèse des nanoparticules et leurs caractérisations.

Mots-clés : Nanoparticules, Biosynthèse, Extraits de plantes, Bactéries, Environnement.

The influence of doping with metals cations on the photocatalytic degradation of Rhodamine 6G in the montmorillonite presence of TiO_2 nanoparticles/ composites

Fatiha Bentaiba[1], Hocine Boutoumi[1], Hossein Khalaf and Ahmed Bouchrit[1]

[1] Laboratory of Chemical Engineering (LGC), University Saad Dahlab of Blida, PO Box 270-09000, Blida, Algeria.

Abstract. Color is the first indicator of contamination to be recognized in wastewater. Many industries, such as, textile, tanning, printing, food, cosmetics, etc...; use organic compounds as dyes to color their final products. The objective of this work was to verify the efficiency of the heterogeneous photocatalysis in the treatment of aqueous solutions containing dyes in mono and multi component mixture. Ag–TiO_2 , Zn–TiO_2 , Fe–TiO_2 / Montmorillonite samples were prepared via deposition–precipitation method and calcined at different temperatures. These samples were characterized by X-ray diffraction (XRD),

UV–vis diffusion reflectance spectroscopy (DRS), BET method, X-ray photoelectron spectroscopy (XPS) . The photocatalytic activities of the samples were tested by photodegradation of Rhodamine 6G under ultraviolet (UV) and visible light irradiation. The results showed that Zn –TiO_2 / Montmorillonite catalysts exhibited higher efficiency for mineralizing Rhodamine 6G than the well-known commercial TiO_2 photocatalyst Degussa P-25. The most important advantage of Zn –TiO_2 / Montmorillonite over Degussa P-25 was that it could be readily separated from aqueous suspensions by sedimentation after the reaction. The results showed that Zn doping induced the enhancement of photocatalytic decolorization and optimal Zn doping is about 0.06 wt.% with 86.2% of decolorization rate under 30 min irradiation time. The repeatability of photocatalytic activity was also tested and the decolorization rate was 81.9% of initial decolorization rate.

Key words: Zn, Fe, Ag, TiO_2 , Nanocomposite, Montmorillonite, Photocatalytic activity, Rhodamine 6G.

Optimization of a Pharmaceutical Pollutant degradation by Homogeneous Fenton oxidation Using a Box-Behnken design

Chala Mouna[1], Boumechhour Fatima[2] and Boudrahem Nassima[1]

[1] Department of Environmental Engineering , Faculty of National Polytechnic School,16200, El Harrach, Algiers, Alegria.
[2] University M'hamed Bougara of Boumerdes/ Algeria.

mouna.chala@g.enp.edu.dz

Abstract. This study aims to demonstrate the effectiveness of advanced oxidation processes in degrading pharmaceutical products. In this context, the study focused on the Fenton degradation of a pharmaceutical product, paracetamol, in aqueous solution. This active ingredient was chosen due to its widespread national use, its environmental impact, and its proven presence in wastewater treatment plants. The Box-Behnken design was applied to evaluate the effect parameters. The efficiency of this treatment was monitored by analyzing the overall parameter of Chemical Oxygen Demand (COD). Based onANOVA studies, the results show that the COD removal rate varies depending on the pH, $[H_2O_2]/[Fe^{2+}]$, and $[H_2O_2]/[PCT]$ ratios. A high removal rate estimated at approximately 84.05% was achieved at pH=3 and $[H_2O_2]/[PCT]$=15, with a degradation time of 60 minutes.

Key Words: Fenton; Paracetamol; COD removal; Box-Behnken design

Study of COD Adsorption on Activated Carbon Prepared from the Date Stones of the South of Algeria

Selma Benbitour1 and Meriem Brihmet 2 and Messaouda Maatallah 3

benbitourselma@yahoo.com

Abstract. the aim of valorization of local lignocelluloses natural residue from different activated carbon with a high surface areas were prepared by chemical activation using the phosphoric acid H_3PO_4 from the date stones of two locals varieties (Ghars) of the region of Ghardaia of Algeria .

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The adsorption of the organic pollutant (COD) of wastewater from the Kef eddoukhan (Ghardaia) by the activated carbon has been studied. Under the process conditions there is a maximum absorption efficiency of this pollutant 83.8 %.

The experimental data were well described by the isothermal equilibrium equation Langmuir type II. The kinetics of COD adsorption obeys the intra cellular model.

Keywords: waste water, date stone, adsorption ,activated carbon.

Study of the phytoremediation potential of *Atriplex halimus* L. and *Atriplex canescens* (Pursh) Nutt. For lead-contaminated soil cleanup (biochemical parameters)

Laila Naib[1], Djilali Baghdadi[1], Amaria Belarbi[2], Allem Baghdad[3] and Laid Bouchaala[4]

[1] Environment and Sustainable Development Laboratory (ESDL), Department of Biological Sciences.University of AHMED ZABANA, Relizane, ALGERIA.
[2] Plant Protection Laboratory, Department of Agricultural Sciences, University of Abdelhamid Ibn Badis, Mostaganem, ALGERIA.
[3] Directorate of Water Resources of the Province of MASCARA 29000, ALGERIA.
[4] Environmental Research Center (CRE), Environmental innovation and eco-management waste Division, Annaba. Algeria.

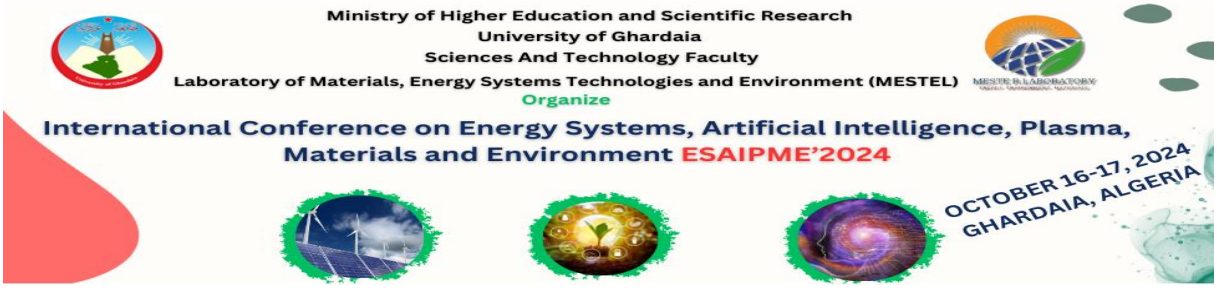
laila.naib@univ-relizane.dz

Abstract. The increased presence of heavy metals in soil poses significant environmental risks due to their adverse effects on ecosystems. This study aims to conduct a comparative analysis of lead's impact on chlorophyll levels in two Atriplex species: *Atriplex halimus* L. and *Atriplex canescens* (Pursh) Nutt. These species are notable for their adaptability to extreme environmental conditions and their capacity to accumulate heavy metals. Through this comparative analysis, we will evaluate the biochemical response of these species to three different lead concentrations (0 ppm, 5000 ppm, and 10000 ppm), focusing on chlorophyll levels as a widely recognized biomarker indicating resistance to abiotic stresses. Our research reveals a clear influence of lead on Atriplex, leading to a reduction in chlorophyll content (chl a, chl b, and chl t) across both species exposed to varying lead concentrations (5000 and 10000 ppm) compared to control groups. This decline is notably more significant in *Atriplex halimus*. These findings offer valuable insights into the impact of lead on Atriplex plants cultivated in contaminated soil, underscoring their potential as candidates for phytoremediation. This suggests promising opportunities for employing these species in environmental cleanup initiatives.

Keywords: Chlorophyll, *Atriplex canescens* (Pursh) Nutt., *Atriplex halimus* L., Lead, stress.

Treatment of Fluoride Contamination from Water Environment Using Eggshells Waste as an Affordable Alternative Adsorbent.

Ayachi Amor Asma *[1], MESSAITFA Amar [2], Tabchouche Ahmed [3], Souad Zighmi [4], Said bachir [5], Fatma Zohra Ayachi Amor [6].



[1,2,4]Engineering Laboratory of Water and Environment in Middle Saharan, University Kasdi Merbah Ouargla, 30000 Ouargla
3,5 Laboratory of Dynamic Interactions and Reactivity of Systems, University of Kasdi Merbah, 30000 Ouargla, Algeria
6 Applied Sciences Faculty, Process Engineering Laboratory, Ouargla University, Ouargla 30000, Algeria.

aychiomar12@gmail.comayachiomar.asma@univ-ouargla.dz

Abstract. Fluorosis illness is a quiet pandemic in southern Algeria that produces a variety of dental and bone abnormalities. The primary cause of this pandemic is long-term intake of fluoridated water and agricultural goods. If it is surpassed, the WHO sets a fluoride ion concentration of 1.5 mg/l. This study tries to reduce the proportion of fluoride ions in drinking water. Eggshells were employed as an adsorbent during fluoride adsorption. The eggshells were broken and sieved into three particle sizes (125, 500, and 1000µm) then heated at various temperatures (378 K). XRD, FT-IR, pHpzc, SEM, and TG/DTA analysis were utilized to characterize the adsorbents. Adsorption batch tests were performed to investigate the adsorption capacity of eggshell powder. Examples include particle size, preparation temperature, contact duration, and adsorbent dosage. The efficacy of fluoride removal was assessed using a UV-VIS spectrophotometer. Eggshell powder heated at 373 K with 250µm particle size was determined to be the most effective adsorbent, with a maximum fluoride removal efficiency of 55.3%, a maximum adsorption capacity of 0.062mg/g, and a residual fluoride concentration of 1.07mg/L within 160 minutes. The adsorption kinetic data on eggshells calcined at 378 K were effectively fitted with the pseudo-second-order model, resulting in a satisfactory coefficient of determination (R^2=0.994). A tow g adsorbent dosage and 1 hour of contact time were adequate to reduce fluoride levels from 2 to 1.08 mg/l. shows that the procedure is effective discovered that the optimal approach for treating water from the Ouargla region which has a high population element fluoride. The fact that this procedure is non-toxic and less costly is another benefit.
Keywords: Eggshells Waste; Fluorosis; Defluoridation; Adsorption; Green Solution.

Synthesis of a New Generation of Green Solvents (deep eutectic solvents) and Their Applications in Liquid-Liquid Equilibria for Pollutant Extraction

Berkane Omar[1], Kelai Ilyes[2,3] and Sifaoui Hocine[1]

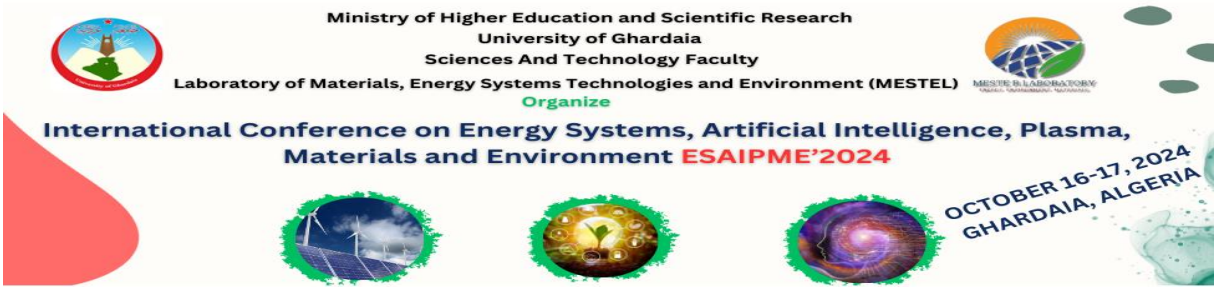
[1] Laboratory of physical-chemical of materials and catalysis, University A. MIRA, Bejaia
[2] Scientific and Technical Research Center for Physicochemical Analysis (CRAPC), Ouargla, Algeria
[3] Laboratory of Biological Oceanology and Marine Environment, USTHB, Bab ezzouar

omar.berkane@univ-bejaia.dz

Abstract. In the past decade, the research was particularly intensive in the petrochemical industry in attempt to produce environmentally and friendly fuel with as little harmful aromatic, sulfur and nitrogen organic components as possible [1]. Nitrogen compounds, which are naturally present in fuel can form N-oxides (NOx) during combustion. The emission of NOx into atmosphere leads to air pollution, acid rain and, at some conditions, they are precursors of particulate matters. Moreover, nitrogen-containing compounds impose several operational issues in oil refineries, including gum formation, acid catalyst inhibition/deactivation, and equipment fouling [2]. Therefore, the removal of nitrogen compounds from fuel is an essential process in the oil refining industry. In this study, we investigated the possible use of Deep Eutectic Solvents (DESs) as solvents for separation problems in petroleum industry: {nitrogen compound + aliphatic hydrocarbon}. Benzyl-triethylammonium chloride: ethylene glycol (BTEAC-EG) and Benzyl-triethylammonium chloride: Lactic acid (BTEAC- Lactic) based DESs are tested to extract Quinoline from n-decane. Liquid-liquid equilibria of the ternary mixtures {Alkane + Heteroatom + DES} were

measured at 295.15 K at atmospheric pressure. The selectivity and the solute distribution ratio values were calculated, the consistency and reliability of the experimental data were verified and validated by the Othmer-Tobias and Bachman correlations. Preliminary results indicate that the use of DESs, as an alternate solvent to replace traditional organic solvents in liquid/liquid extraction of heteroaromatic compounds are very promising.

Keywords: Deep Eutectic Solvents, nitrogen organic components, air pollution, oil purification, Liquid, liquid equilibria.



Natural Sources and Physicochemical Tests

Phytochemical study of various extracts prepared from an Algerian plant

Wassila Benchadi[1], Hamada Haba[1], Emerson Ferreira Queiroz[2], Laurence Marcourt[2], Jean-Luc Wolfender[2] and Mohammed Benkhaled[1]

[1]Laboratoire de Chimie et Chimie de l'Environnement (L.C.C.E), Département de Chimie, Faculté des Sciences, Université de Batna, Batna 05000, Algérie.
[2]Phytochemistry and Bioactive Natural Products, School of Pharmaceutical Science, EPGL, University of Geneva, Geneva, Switzerland.

be.wassila@yahoo.fr

Ministry of Higher Education and Scientific Research
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Abstract. Fabaceae is one of the most important families, it comprises approximately 640 genera and 18000 species. The plants of this family are known for their richness in very important bioactive molecules. The present work describes the phytochemical investigation of crude extracts (petroleum ether, ethyl acetate and *n*-butanol) prepared from the species *Onobrychis crista-galli* (L.) Lam, using different protocols and reagents. The chemical investigation of the different extracts using different chromatographic methods (VLC, CC, TLC, MPLC and semi-preparative HPLC). The previous phytochemical investigation of *Onobrychis crista-galli* species resulted in the isolation of flavonoids, a lactone monoterpene, derivatives of benzoic acid, a derivative of eugenol, a cyclitol, free osides and a phytosterol. The identification process involved spectroscopic analysis, including 1D and 2D NMR (^{1}H, ^{13}C, COSY, HSQC, and HMBC) as well as mass spectrometry (ESI-MS) and comparison with literature data.

Keywords: Fabaceae, *Onobrychis crista-galli* (L.) Lam , Phytochemical investigation, NMR, ESI-MS.

Predicting the blood-brain barrier permeability values (logBB) of CNS drugs using a QSPR modeling: a hybrid Dragonfly-Support Vector Regression Algorithm (DA-SVR)

Meriem Ouaissa[1], Maamar Laidi[1], and Othmane Benkortbi[1]

[1]Dr.Yahia Fares University of Medea, Department of Process and Environment Engineering, Medea –Algeria

ouaissa.meriem@gmail.com

Abstract. This work aims to develop a quantitative structure-property relationship (QSPR) model to predict the blood-brain barrier permeability values (logBB) of CNS drugs. The Genetic algorithm is coupled with the Supper Vector Machine (GA-SVM) for the selection of the most pertinent molecular descriptors. To construct the QSPR model, two machine-learning algorithms were employed: Support Vector Regression (SVR), and Support Vector Regression with Dragonfly Algorithm (DA) for parameter optimization (DA-SVR). Different Statistical parameters were used to evaluate and validate the developed models. The generated SVR model had an R2 of 0.867 and an RMSE of 0.178, while the generated DA-SVR model had an R2 of 0.928 and an RMSE of 0.129. The findings demonstrated that the utilization of the Dragonfly Algorithm (DA) for parameter optimization improved the performance of the Support Vector Regression (SVR) model. The DA-SVR model achieved the best prediction results and contributed well to the blood-brain barrier permeability values.

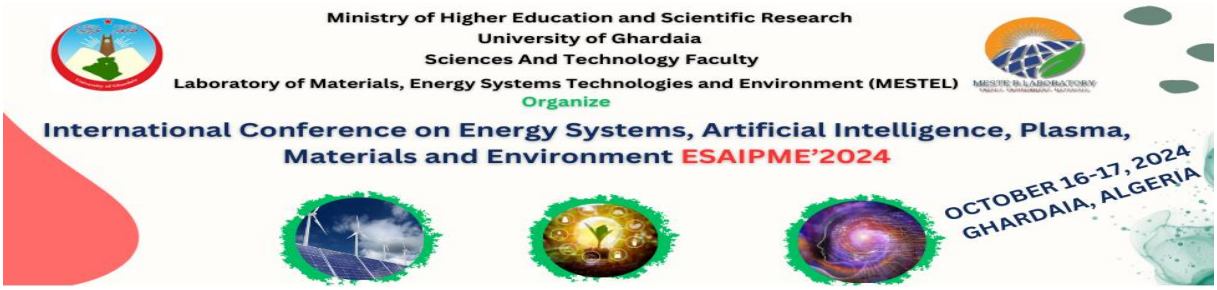
Keywords: First hybrid Dragonfly, Support Vector Regression Algorithm (DA-SVR), Quantitative Structure, Property Relationship (QSPR), Blood blood-brain barrier permeability (logBB), CNS drugs.

Encapsulation of *Laurus Nobilis.L* essential oil for biotechnological applications

RAACHE Imane[1-2] ; BOUHAFES Imane[1] and DJEBRIT Sara[1]

[1] Process Engineering Department, Faculty of Sciences and technology, Ghardaia University 47000, Algeria.
[2] Lab. Dynamic Interactions and Reactivity of Systems, University Kasdi Merbah, Ouargla 30000, Algeria

raache.imane@univ-ghardaia.dz



Abstract. The aim of this study is to extract the essential oil and and to exploit active principles of theLaurus Nobilis.L from the Ghardaïa region. The objectives include determining physicochemicalindices, identifying their chemical composition, evaluating biological activities suchas antibacterial and antioxidant activities.

The essential oil yield obtained by hydro-distillation is 0.83%. This oil was analyzed usinggas chromatography coupled with mass spectrometry, identifying 33 constituents. Eucalyptolwas found to be the major compound in the essential oil (33.06%). Our oil showed significantinhibition percentage with an IC50 value of 0.2033 mg/ml against the DPPH radical. It also exhibited antibacterial activity against tested strains, with the Gram-negative fungal strain Candida albicans being the most sensitive, showing an inhibition zone of 30 mm.

To preserve the active principles of Laurel oil and enhance its stability, we employed encapsulation through the method of inverse gelation and external gelation using biologically synthesized zinc oxide nanoparticles from the plant extract. The capsules obtained were characterized by optical microscopy to determine their structure.

The Nanoparticles were characterized using X-ray diffraction (XRD), scanning electron microscopy (SEM), and energy-dispersive X-ray spectroscopy (EDX). Furthermore, we evaluated the antibacterial activity of ZnO NPs against Gram-negative and Gram-positive bacterial strains.

In evaluating the effectiveness of our capsules obtained through internal and external gelation based on ZnO nanoparticles, we studied the release kinetics of the essential oil using the DPPH test. Additionally, a food preservation test was conducted against spoilage and bacterial proliferation.

Keywords Essential oil, *Laurus Nobilis L.*, Zinc oxide nanoparticle, Encapsulation, Antibacterial activity, Antioxidant activity.

Evaluation of antioxidant and antimicrobial activities of Moringa *leaves extracts* from the region of Ghardaia.

Laghouiter Oum Kelthoum[1], Ikram Djloud[1], Siham Sabrou

[1] Département de Génie des procèdes, université de Ghardaïa

laghouiter.oumkelthoum@univ-ghardaia.dz

Abstract. As part of the development of medicinal plants growing in the Ghardaia region through the extraction of bioactive substances for pharmacological purposes. This work aims to evaluate the antioxidant and antimicrobienn activity of protein compounds extracted from the leaves of *Moringa Oleifera*, which is considered, according to several studies, as a source of bioactive substances of great nutritional and pharmacological value.

The photochemical analysis shows the diversity of the leaves and their richness in various proteins, The quantification of proteins in the extracts of *Moringa* leaves by two methods (Biuret and Lowry) shows that these leaves are rich in proteins (27.614% marc) with the predominance of albumin (10.786% marc) followed by globulin, prolamin and glutelin in small quantities. Low contents are illustrated by Lowry's method (6.214-19.732%). furthermore, the protein fractions of Moringa leaves present a good oxidative stress compared with vitamin C, especially for albumin extract (2.238 mg VCEAC) evaluated with phosphomolybdate test.

The evaluation of the antimicrobial activity in vitro by the disk diffusion method against four bacterial strains shows the ability of Prolamin fraction to inhibit *E.coli and S. aureus* strains. The same for glutelin fractions against *P. aeruginosa* and *S. saprphticus*.

The studied extracts showed that local Moringa leaves may conceder as food source rich in bioactive elements (proteins) with pharmacological properties and an antimicrobial agent against certain pathogenic bacteria.

Keywords:*Moringa Oleifera leaves* Protein compounds, Antioxidant activity, Phosphomolybdate test, Antibacterial activity.

Extraction, characterization and rheological behavior of a water-soluble polysaccharide from *Plantago ciliata* Desf. Seeds

Noura Addoun[1], Zakaria Boual[2], Cédric Delattre[3,4], Alina V. Ursu[3], Jacques Desbrieres[5], Didier Le Cerf[6], Christine Gardarin[3], Faiez Hentati[3], Mohamed Didi Ould El-Hadj[2], Philippe Michaud[3] and Guillaume Pierre[3].

[1]Département de Biologie, Faculté des Sciences de la Nature et de la Vie et Sciences de la Terre, Université de Ghardaia, BP 455, Ghardaïa 47000, Algérie
[2] Université Kasdi Merbah Ouargla, Laboratoire de Protection des Ecosystèmes en Zones Arides et Semi-Arides, 30000 Ouargla, Algeria.
[3] Université Clermont Auvergne, CNRS, SIGMA Clermont, Institut Pascal, F-63000 Clermont-Ferrand, France.
[4] Institut Universitaire de France(IUF), 1 rue Descartes, 75005 Paris, France.
[5] Université de Pauet des Pays de l'Adour, IPREM, Helioparc Pau Pyrénées, 2 avenue P. Angot, 64053 Pau cedex 9, France.
[6] Normandie Univ, UNIROUEN, INSA Rouen, CNRS, PBS, 76000 Rouen, France

addoun.noura@univ-ghardaia.dz

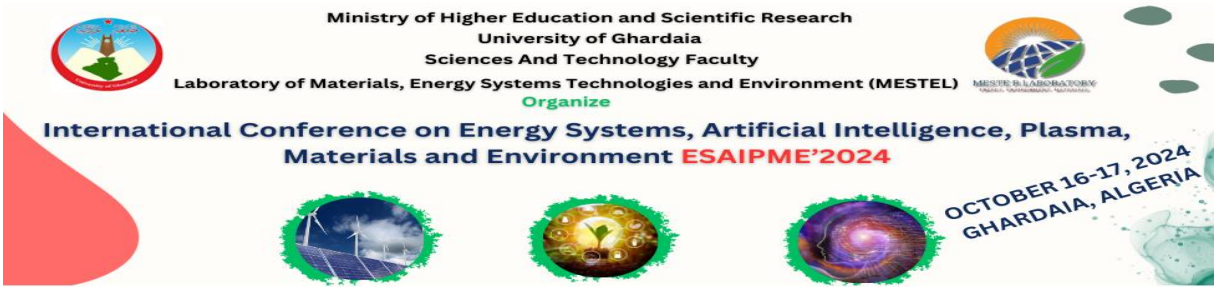
Abstract. Water soluble polysaccharide (PSPC) was extracted from the seeds of *Plantago ciliata* Desf., a medicinal plant native to Ghardaïa province (northeastern Algerian Sahara). The extraction resulted in a yield of approximately 18.6% (w/v). Analysis of the monosaccharides and glycosyl-linkage composition through GC/MS revealed that PSPC is an arabinoxylan, consisting mainly of xylose (78%) and arabinose (18%). Structural characterization identified a *β*-D-xylan backbone with (1→3) linkages and some (1→4) linkages. Furthermore, the macromolecular properties of PSPC in aqueous solutions were further evaluated using SEC/MALLS, which determined its high molecular weight of around 700 kDa, coupled with a relatively low polydispersity index (PDI) of 1.47 and an intrinsic viscosity [η] of 157 mL/g. PSPC exhibited a pseudoplastic behavior in semi-dilute solutions, with a critical overlap concentration (C*) ranging from 0.32% to 0.37% (w/v).

Keywords:*Plantago ciliata*, polysaccharide, arabinoxylan, Rheology, Ghardaïa.

Analysing the antioxidant capacity and nutritional value of Algerian date juices (*Phoenix dactylifera L.*)

Bachir Bensalah[1] and Sabrina Lekmine[2]

[1] Département de biologie, Faculté des sciences de la nature et des sciences de la vie et de la terre, Université de Ghardaïa, Algérie



[2] Laboratoire de Biotechnologie, Eau, Environnement, et Santé. Université Abbes Laghrour, Khenchela, Algérie

biobachir@gmail.com

Abstract. The significance of taking into account the chemical composition of the fruits that are available to customers has been brought to light by renewed interest in the role that fruits consumption plays in preserving and improving human health. The primary chemical composition of the juices from ten coastal cultivars of the Algerian date palm (Phoenix dactylifera L.) was examined. By turning marginalised date palm cultivars into juices, this work helps to elevate them. The results indicate that for the cultivars under study, the yield of juice extraction surpasses 75%. These juices have a moderate acidity level, ranging from 0.082 g L-1 for Tamjouhert juice to 0.188 g L-1 for Tdelt juice, and are high in reduced sugars (glucose and fructose). The potassium (K) content of the examined juices is remarkably high; the cultivar Ghars's juice has the greatest value, at 1416.2 mg kg-1 of dry weight (DW). All of the juices had extremely low Na/K ratios, which lends this product both nutritional and medicinal value. Significant amounts of other minerals were also found in each juice. Ghars's juice has an inhibition percentage of 52.45% for free radicals DPPH, while Tamjouhert juice has an 81% inhibition percentage.

Keywords: Date juice, Algeria, chemical composition, Antioxidant, DPPH.

Phytochemical screening and yield of two differential extracts obtained by soxhlet from a species of the Asteraceae family from the Ain Temouchent region

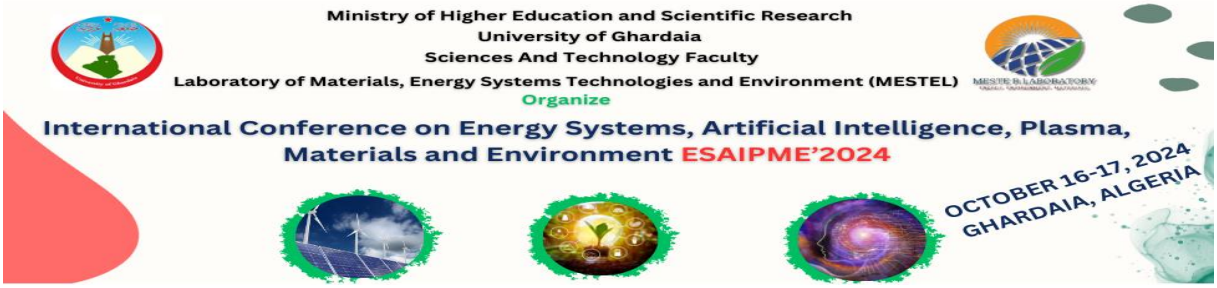
YOUNES Ikhlas [1] and BELKACEM Nacéra [1]

[1] Antifungal antibiotics laboratory: physicochemistry, synthesis and biological activity, Faculty of Natural and Life Sciences, Earth and Universal Sciences, Abou-Bekr-Belkaid University, BP 119, Imama, Tlemcen, Algeria.

ikhlas.younes@univ-tlemcen.dz

Abstract. The Compositae (Asteraceae) are a family of flowering plants with around 20,000 species. Their distinctive quality lies in their variety and worldwide distribution. The biological properties of the Asteraceae family have been the subject of numerous scientific studies. These studies have shown that it has powerful anti-inflammatory, antioxidant, anti-diabetic and antimicrobial activity, as well as diuretic and healing properties. Their pharmacological potential can be explained by the variety of their phytochemical components. The aim of this study was to establish a comparative evaluation of the yield and phytoconstituents obtained after successive soxhlet extraction of a species of the Asteraceae family using two solvents of different polarity. The yield for each extract was calculated based on the appropriate formula after obtaining a dry extract and the qualitative phytochemical tests were performed using the methods outlined by Harborne, 1998 and Evans, 2009. The results showed a difference in the yield obtained after successive extraction with two solvents of different polarity, chloroform and methanol. It was found that after extraction with chloroform, the yield obtained was 2.25%; however, extraction with methanol gave a yield of 14.02%. In addition, qualitative phytochemical tests revealed the presence of reducing compounds, flavonoids, saponins, quinones and alkaloids. These results revealed a distinct composition of the secondary metabolites in the two extracts, such as the presence of alkaloids in methanolic and non-chloroformic extracts. This study examines qualitatively the phytochemical composition of a species of the Asteraceae family from the Ain Temouchent region, with a view to assessing its pharmacological potential.

Keywords: Phytoconstituents, Asteraceae, Yield, Soxhlet, Extraction solvent, Polarity.



Comparative Evaluation of the Biological Activities of Nanoparticles and Aqueous Extract of Ricinus communis in the Ain Temouchent Region

Farid bennabi khadra bendjedou, yasmine khane, abdelkader nebatti ech-chergui, walid mohamedi, khaled rahmani, fatima benyousef, ali khalfa

Laboratory of Applied Hydrology and Environment, University of Ain Temouchent Belhadj Bouchaib, Ain Temouchent, Algeria
Département de Biologie Faculté des Sciences et de la Technologie universite- ain temouchent –belhadj bouchai algérie.

Summary. Phytotherapy holds a prominent place in the health system, with medicinal plants such as Ricinus communis, which belongs to the Euphorbiaceae family and originates from tropical Africa. The alcoholic extracts of R. c. exhibit various biological activities such as antioxidant, antibacterial, and anti-inflammatory properties.

Problematic and Objective: This work aims to establish a comparative study of some biological activities between nanoparticles and the aqueous extract of the medicinal plant Ricinus communis from the Ain Temouchent region.

The synthesis of silver nanoparticles was performed using an environmentally friendly method, using the extract of R. c. leaves as a stabilizing agent. The optical, structural, surface morphological, and antibacterial properties of the synthesized Ag NPs were studied.

The antioxidant activity test indicates a strong antioxidant power for the nanoparticles with an average IC50 = 0.679767 mg/ml, compared to the aqueous extract of the leaves which was less active with an average IC50 = 1.0756 mg/ml. The antibacterial effect of the aqueous extracts and nanoparticles was evaluated by the agar diffusion method, showing high antibacterial activity against the four tested strains (P. aeruginosa, E. coli, S. aureus) with varying inhibition zones. The nanoparticles exhibited a more significant antibacterial effect than the aqueous extract regardless of the bacterial strain. Additionally, the anti-inflammatory power of the NPs was demonstrated, comparable to that of ascorbic acid, according to erythrocyte membrane stabilization and hemolysis tests.

The synthesis of AgNPs using plant extracts as a reducing agent presents promising results compared to the aqueous extract for biological tests.

Keywords: Ricinus communis, silver nanoparticles, medicinal plant, antioxidant activity, anti-inflammatory activity, antibacterial activity.

Valorisation de l'huile essentielle du Faux Poivrier dans la région de Mascara

Lalia AMMAR[1,2]

1 Laboratoire de recherche en géo-environnement et développement des espaces. Université Mustapha Stambouli de Mascara.
2 Laboratoire de recherche sur les systèmes biologiques et la géomatique. Université Mustapha Stambouli de Mascara.

ammar_lalia@yahoo.com

Ministry of Higher Education and Scientific Research
University of Ghardaia
Sciences And Technology Faculty
Laboratory of Materials, Energy Systems Technologies and Environment (MESTEL)
Organize
International Conference on Energy Systems, Artificial Intelligence, Plasma, Materials and Environment ESAIPME'2024
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Abstract. Schinus molle L. (Sapindales : Anacardiaceae), connu sous le nom de poivre du Pérou, est un arbre ornemental à feuillage persistant, originaire d'Amérique du Sud et largement répandu dans la région méditerranéenne. Les huiles essentielles de S. molle ont précédemment démontré diverses activités biologiques, notamment anti-inflammatoires, antidiabétiques et antioxydantes. Notre travail de recherche s'inscrit dans le but de la valorisation et l'exploitation du cortège floristique local. Cette étude vise à déterminer la composition chimique de l'huile essentielle (HE) extraite des parties aériennes de S. molle, récoltées à la ferme expérimentale de l'université de Mascara en février 2020. L'identification des principaux constituants par la GC/MS a indiqué que les HE du S. molle sont formés de 51 composés. Le composant principal était le Shyobunone (10,14 %), suivi de 1-Phellandrene (9,63 %), α-Cadinol (7,46 %), δ-Cadinene (7,45 %), Germacrène D (7,09 %) et α-Elemol (6,48 %). La fraction des sesquiterpènes oxygénés et des sesquiterpènes hydrocarbonés était dominantes, avec des taux respectifs de 41,18 % et 39,21 %. Tandis que les monoterpènes hydrocarbonés et oxygénés représentaient respectivement 11,76 % et 7,84 %.

Keywords: Schinus molle, huile essentielle, GC/MS.

The Soxhlet Method: Unlocking the Potential of Extractives for Pharmaceutical Applications

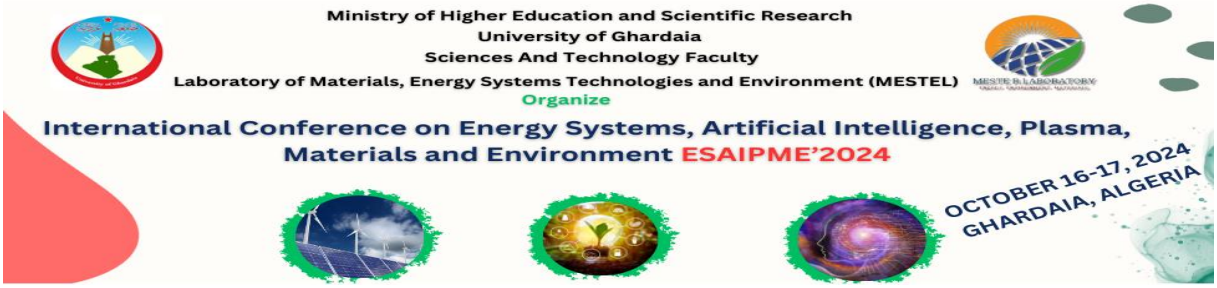
Zineb LAALI[1]*, Rihab BOUSHABA[2], Khatima KAABECHE-DJERAFI[1].

[1*]LGPDDPS Laboratory, Department of Process Engineering, National Polytechnic School of Constantine, 25005, Algeria.
[2]Department of Pharmaceutical Engineering, Faculty of Process Engineering, University Constantine 3-Salah Boubnider, Constantine, Algeria.

* Laali.zineb@gmail.com

Abstract. Extractives refer to the various bioactive compounds that can be obtained from plants, which include essential oils, polyphenols, alkaloids, flavonoids, and other secondary metabolites. These compounds can be developed into drugs for various ailments, leveraging their antioxidant, anti-inflammatory, and antimicrobial properties, incorporated into supplements and functional foods for their health benefits and even used in cosmetics. Soxhlet extraction is a widely used method for extracting compounds from solid materials, particularly in the field of phytochemistry. It allows for the efficient extraction of phytochemicals from plant tissues. The olive oil industry generates several by-products during the extraction and refining processes. These by-products have various applications and potential for value addition. In this work, we used the Soxhlet method to extract extractives from the by-products of the olive industry in order to assess their phytochemical potential, the results were analysed using qualitative evaluation of GC/MS spectras, we had two types of extractives, ethanol extracted compounds and ultra-pure water extracts. The results showed variety of compounds from flavonoids to alkaloids and tannins. The results underscore their importance in improving health, enhancing product quality, and supporting environmental sustainability.

Keywords: Extractives, Bioressources, Olive waste, Sustainability.



High-Sensitivity Surface Plasmon Resonance Sensor Us-ing Photonic Crystal Fibers with Horizontal Elliptical Air Holes

Assia Hamzaoui [1-2], Abdelaziz Aouiche[1-2], Soraya Gouder[1-2], and Soufi Youcef [1-3].

1 Department of Electronics and Telecommunications, Faculty of Science and Technology, Echahid Cheikh Larbi Tebessi University- Tebessa. Algeria.
2 Laboratory of Mathematics, Informatics and Systems (LAMIS).
3LABGET Laboratory

assia.hamzaoui@univ-tebessa.dz
abdelaziz.aouiche@univ-tebessa.dz

Abstract. This study details the development of a surface plasmon reso-nance (SPR) sensor that leverages photonic crystal fibers (PCF) for enhanced sensing capabilities. The sensor's performance was rigorously evaluated using the finite element method, which provides a comprehensive understanding of its operational characteristics under various conditions. To assess the effectiveness of the sensor, both wavelength and amplitude interrogation techniques were employed. These methods allow for a detailed analysis of the sensor's response to changes in refractive index (RI), enabling precise measurements that are es-sential for various applications. The results revealed that the sensor achieved an impressive maximum wavelength sensitivity (WS) of 10,000 nm/RIU for the y-polarized mode at an analyte RI of 1.39. This level of sensitivity indicates the sensor's remarkable ability to detect even the smallest changes in the refractive index of the analyte, making it a valuable tool in sensitive detection applica-tions. In addition to its high sensitivity, the sensor also demonstrated an excep-tional resolution of 10-7 RIU across a refractive index range from 1.36 to 1.40. This indicates not only the precision of the sensor but also its reliability in vari-ous operational settings. These performance metrics underscore the sensor's po-tential for practical applications in diverse fields, including environmental mon-itoring, biomedical diagnostics, and chemical sensing, where accurate detection of analytes is critical for ensuring safety and effective-ness. Overall, the promis-ing results of this study highlight the potential of the SPR sensor utilizing PCF technology to advance sensing capabilities, paving the way for future innova-tions and developments in sensor technology that can address real-world chal-lenges across various domains.

Keywords: Surface Plasmon Resonance (SPR), Photonic Crystal Fibers (PCF), Wavelength Sensitivity (WS), Refractive Index (RI), Sensing Performance.

Cardenolide glycosides from the aerial parts of *Pergularia tomentosa.L*

Zohra BABAAMER [a,c]*, Fayza Kouadri[b] and Musa Abu Zarga[c]

a Laboratory of Materials, Energy Systems Technology, and Environment, Faculty of Science and Technology, University of Ghardaia, Algeria.
b the Faculty of Pharmacy, Middle East University, Amman
cChemistry Department, University of Jordan, Amman, Jordan.

* babaamerz@yahoo.fr

Abstract: The chemical constituents from the aerial parts of *P. tomentosa.L.* were studied. The constituents were isolated and purified by various chromatography methods, and spectroscopic methods (MS, NMR) were used to identify their structures. A new *cardenolide glycoside* ***1***, along with five known cardenolide glycosides *calactin* ***(2)***, *12 β-hydroxycalotropin* ***(3)***, *6'-*

hydroxycalactin ***(4)***, *galakinoside* ***(5)*** and *uscharidin* ***(6***) were identified and isolated for the first time from *Pergularia tomentosa. L*. Structure determination was performed by chemical methods, and spectroscopic techniques, including (2D-NMR, IR, and MS) and by comparison with literature data.

Keywords: *P. tomentosa. L*, Asclepiadaceae, cardenolides, 2D-NMR,

Use of a fermented nettle extract in bioplastic and study of its biological and physicochemical activity

Lamia BENNABI[#1,6], Ilham ABEDELEMALEK[2], Kaddour BAHRAM[3], Faiza BENNABI [4], AEK .LOUKILI[5] ,AEK.LECHELACHE[5] ,Kaddour GUEMRA[6]

[1,5] Department,of of matter sciences University of Chaib Bouchaib.Ain Temouchent
[2]Department of Chemistery,University of Ibn Kaldoun ,Tiaret .Laboratory of synthesis and catalysis
[3]Department of Mechanical Engineering, UniversityChaib Bouchaib Ain Temouchent
Laboratory of Materials and Reactive Systems LMSR Sidi Bel Abbes, Algeria
[4]Departement of environment UDL,Sidi bel abbes laboratory of eco-development of spaces
[6]Laboratory of Organic Chemistry physical and macromolecule.U.D.L Sidi Bel Abbes

[#1]Lamia.bennabi@univ-temouchent.edu.dz

Abstract. Plastic packaging represents one of the most important areas of the industry, more especially food plastic packaging, which can adversely affect the quality of food, and the preservation, or the release of molecules harmful to human health in this perspective, we have thought of manufacturing a biodegradable and antimicrobial film, based on fermented extract of a spontaneous plant which the nettle known for its antibacterial character, In order to ensure resistance to plastic, we synthesized polystyrene by radical route, then it was integrated at a rate of 30% by mass, with starch in a plastic; in order to reveal the antimicrobial character of the fermented nettle extract, A retention study revealed that starch-based plastic does not have a good retention rate; comparing to plastic, starch-based is extracted from nettle. A rheological study has been carried out in order to reveal, that the plastic based on 100% starch, must be reinforced for later use in the field of packaging. The polystyrene was characterized by infrared spectroscopy and XRD.

Keywords: Starch, strains , polystyrene , rheology

Alternative beekeeping meadows for the healthy wintering of bees in natural ecosystems and agroecosystems in the Algerian Sahara.

Mohammed Tahar MEBARKI[1*], Salim MEDDOUR[1,2], Chaker Rabou MEDDAKEN[3], Mohammed KADRI[4].

[1]Department of Agricultural Sciences Faculty of Nature and Life Sciences and Earth Sciences, University of Ghardaia 47000, Ghardaia, Algeria.

Ministry of Higher Education and Scientific Research
University of Ghardaia
Sciences And Technology Faculty
Laboratory of Materials, Energy Systems Technologies and Environment (MESTEL)
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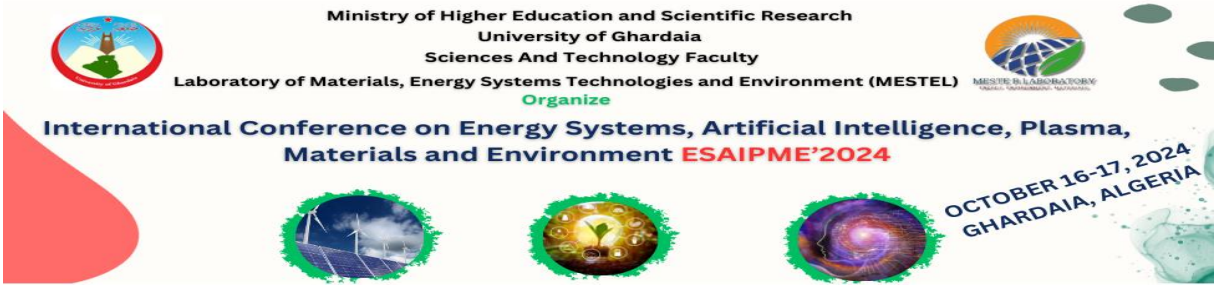
[2]Valorization and Conservation of Arid Ecosystems Laboratory (LVCEA). Faculty of Nature and Life Sciences and Earth Sciences, University of Ghardaia 47000, Ghardaia, Algeria.
[3]Department of Biological Sciences. Faculty of Nature and Life Sciences and Earth Sciences, University of Ghardaia 47000, Ghardaia, Algeria.
[4]Professional Beekeeping Council W. Ouargla. Algeria.
*Corresponding author: mebarkimoh@yahoo.fr

Abstract. Our current study of beekeeping in Algeria from 2018 to 2022 focused on the difficult times of the year for bees, autumn and winter. During this period, most beekeepers feed the bees with sweet substances extracted from the bees. These solutions exhaust the beekeeper's budget. This is why we have been trying for several years to find alternative solutions, namely: We looked for bee pastures in autumn and winter. We have also tried growing bee-friendly crops that bloom in the evening and in the fall. At first, we moved the bees to natural areas that have ground cover that blooms in fall and winter. These areas are in the extreme south of Algeria, and they are represented in two regions: Djanet, where the Tassili mountains are located, and Tamanrasset, where the Hoggar mountains are located. As these areas are considered semi-tropical where rainfall occurs in late summer and early fall, where is the peak of flowers in fall and winter. But with the advent of the Corona 19 pandemic, it affected the freedom of movement of beehives so we started experimenting with crops that benefit beekeeping and urged agricultural investors to plant fodder corn and colza. When fodder corn plant blooms in October and November. The colza flowers in January and February. We also noticed that these solutions were a refuge for many beekeepers in southern Algeria and in the north as well.

Keywords: Beekeeping, Colza, The fodder corn, Djanet, Tamenrasset, Algérian Sahara.



Recommendations of the Conference

The **ESAIPME 2024** conference brought together experts, researchers, and professionals from various fields to discuss critical issues related to **Energy Systems, Artificial Intelligence, Plasma, Materials, and Environment**. During the conference, several key recommendations were formulated to guide future research and collaboration between academia and industry in these essential fields.

Here are the main recommendations from the conference:

1. **Launch training programs** at Ghardaïa University related to the regional economic environment, such as *Economic Petroleum*.
2. **Develop a research program** focused on energy transition, including the replacement of fossil fuels with renewable energy in various segments of the hydrocarbon chain.
3. **Strengthen partnerships with the socio-economic sector** to address existing challenges. A needs survey can be conducted through workshops involving different sectors.
4. **Direct master's and doctoral theses** around the key issues discussed during this conference.
5. **Promote research outcomes in collaboration with industrial companies**, particularly within the framework of existing regulations established by the
Ministry of Higher Education and Scientific Research (MESRS).
6. **Expand the conference to include industrial operators** (Sonatrach, Sonelgaz, Naftal, Alphapipe, Neftal, Enac,.., etc.) by integrating an exhibition space and industrial visits.
7. **Organize a hackathon** in collaboration with scientific clubs and local startups to encourage innovation and the emergence of new ideas.
8. **Extend the conference to the African continent**, inviting participants and experts from other African countries.
9. **Co-organize future editions of the conference with foreign universities**, such as those in Tunisia, Saudi Arabia, and other partner countries.
10. **Organize parallel workshops with industry professionals** to strengthen collaboration between academic research and industry.
11. **Establish a prize for the best innovative research**, rewarding projects such as patents or quality labels.
12. **Launch an international scientific journal**, titled *International Journal of Energy Systems, Artificial Intelligence, Plasma Materials and Environment*, to disseminate research findings and encourage contributions in these cutting-edge fields.