Book of Abstracts

Second Palestinian International Conference on Material Science and Nanotechnology

(PICNM2016)

Wed. – Thu. 23 - 24 / 3 /2016

Organized by

Faculty of Science

An-Najah National University

Nablus – Palestine

2016

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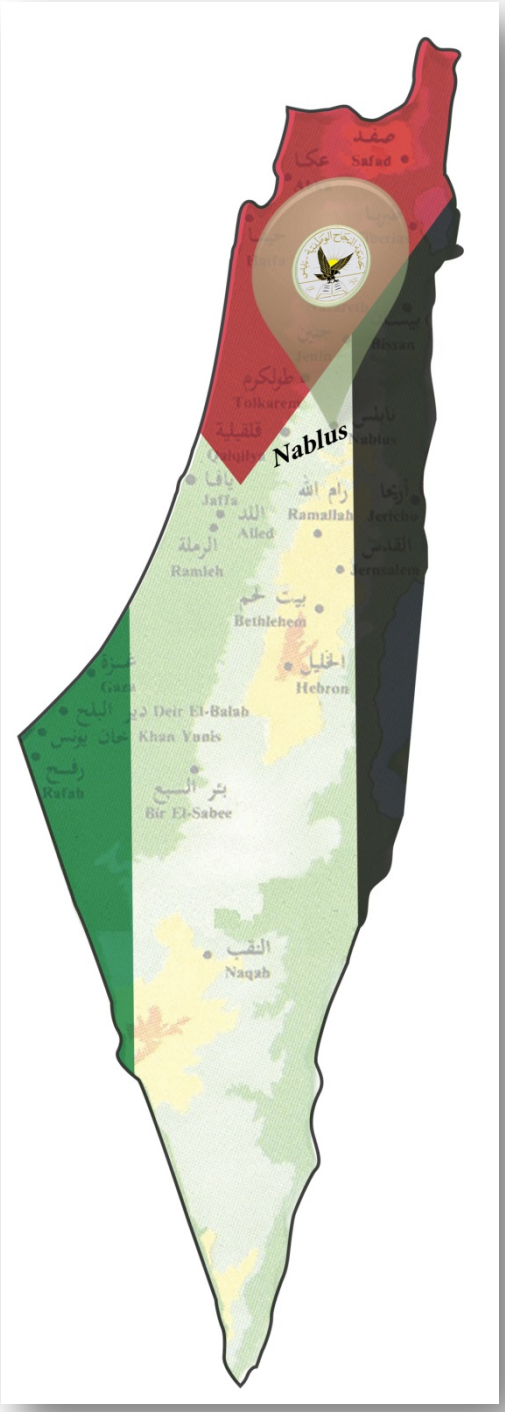
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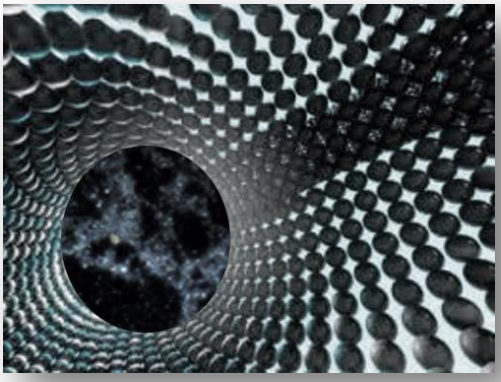

About An-Najah National University

An-Najah National University is a fully independent, non-governmental university, run by the Board of Trustees and the University President. The structure of the administration is composed of the University President, Assistant and Vice Presidents, University and Deans Council, Administrative Departments, and the University Comptroller. The academic structure divides Faculties into academic departments.

An-Najah seeks to provide as many opportunities as possible to its students, through providing each Faculty and Department with a computer lab for students use. This has created a ratio of three students to each computer. Physically challenged and visually impaired students are welcomed at An-Najah. A special computer lab designed for the visually impaired converts all Microsoft Office files to Braille to allow students to share lectures, submit assignments either by email or through the Braille printers available. The University also allocates special cars to transport physically and visually impaired students between campuses.

An-Najah University hosts more than 20 scientific centers that offer a wide range of services to the local society. Among those are two centers that are directly connected with the local society and seek to provide high services to the people in various parts of the country. The first one is the Community Service Center which is involved in numerous projects to help the people of Nablus and the Northern West Bank. The Community Service Center also collects blood samples from the community for transfusions and also provide hot meals to the elderly and needy families in Nablus.

In addition to the Community Service Center there is the Energy Research Center (ERC) which undertakes research in the field of energy and has accomplished a number of projects in many Palestinian cities and villages as in Attouf Village which the Center provided with electricity through harnessing solar power for the first time. In its endeavor to lay down foundations for knowledge-based society, the University established a nucleus for a Center of Excellence in Materials Science and Nano-Technology (CEMSANT). The Center houses researchers and students to perform their works on preparation, modification and application of advanced materials. CEMSANT encourages research activities directed toward the direct benefit of Palestinian society, such as water, environment, health, renewable energy, and agriculture.

About An-Najah National University

To connect to the community, An-Najah has its own radio and satellite television stations. Both these programs provide practical training for An-Najah's students as well as provide an avenue to connect to the community of Nablus and the international community through the satellite station. To reach more students, videoconferences and e-learning lectures are both organized at An-Najah. The e-learning lectures are available for free on the university's website. Videoconferences have been organized between other academic, non-profit, and private institutions to communicate the academic and political situation to outside parties.

Messages

Welcome Message by Prof. Maher Natsheh

It is with great pride that I welcome you to the Second Palestinian International Conference on Materials Science and Nanotechnology (PICNM2016) at An-Najah National University.

This conference will bring together academics , researchers, and industrialists in order to share their latest achievements in the areas of materials science and nanotechnology with special emphasis on practical issues that can help in building a knowledge-based economy in Palestine.

This conference is designed to be broad in scope, intense in material and grounded in relevance. It brings scholars, scientists, industry leaders and policy makers together from across the region for meaningful dialogue. This conference will focus on exhibiting the latest breakthrough in nano-science and technology.
An-Najah National University is one of the pioneer institutions in the region, having earned international acclaim for its academic offerings, research capabilities and civil development projects.

With four campuses it provides state-of-the-art facilities for around 22,000 students currently enrolled in 12 distinct faculties. The University offers 85 Bachelor degree programs, 54 Master's degrees and the only doctorate in Palestine, a PhD in Chemistry and a PhD in physics. These academic offerings are complimented by the University's Scientific Centers which focus on providing technical innovations and social programs for the people of Palestine.
Much of this work is focused on sustainable development and utilizes interdisciplinary approaches to address critical issues such as renewable energy, environmentally ethical agriculture, and water treatment.

The importance of Materials Science and Nanotechnology in sustainable development is not a recent occurrence. For the whole of its existence Materials Science has sought ways to improve the human condition.
Today, we stand at the precipice of a new world, with both the successes and challenges that it brings. Perhaps of greatest importance among these challenges is how we will provide the food and energy for a growing population. Yet we already see the potential for Materials Science and Nanotechnology in alleviating these concerns. Within our lifetime, solar power can become more cost effective than fossil fuels and new fertilizers will improve plant growth and food production. Breakthroughs such as these do not occur because of single person,

compound, or process but are the synthesis of research and application across academia and industry.

This conference is poised to be such a catalyst for innovation. It will cover all areas of different materials and relevant areas of science with an emphasis on research and developments in the fields of Nano scale materials and materials that are related to industry, medicine, water treatment applications, the environment, clean energy and medical sciences. Special attention will be given to the techniques of commercial value such as : nanomaterial's preparation , characterization and its various applications , advanced materials , medical products and pharmaceuticals , polymers, and computational nanomaterial's.
This conference is a testament to An-Najah National University's motto, "We challenge the present to shape the future." Using existing knowledge and scientific principles, we can radically change our worldview and the way we interact with the environment.

I extend my warmest welcome to you on behalf of Nablus, An-Najah National University, and the Second Palestinian International Conference on Materials Science and Nanotechnology (PICNM2016) and look forward to a future built on the work presented here.

Finally, I would like to take this opportunity to thank the PICNM2016 sponsors: Al Rajeh Detergents Factory Co, Al- Zahra Company for Food and Beverage and Omega Company for Raw Materials.

My deep appreciation for the intensive work done by the organizing committee and for those who made this conference possible.

Prof. Maher Natsheh
Acting President

Messages

Welcome Message by Prof. Ghassan Saffarini

Dear colleagues and participants,

It is our great pleasure to welcome you to the Second Palestinian International Conference on Material Science and Nanotechnology (PICNM 2016) and to one of the oldest cities in the world, Nablus. The first international Palestinian conference on nanotechnology for advanced materials and devices was held at An-Najah National University in 2012.

This year's conference has been the pioneering event in Palestine in the field of materials, nanomaterials and nanotechnology. It brings together scientists, researchers and students from the Arab World and abroad and from all disciplines under one umbrella to discuss the latest advances in materials science and nanotechnology. Emphasis will be put on issues related to industry, medicine, water treatment applications, the environment and clean energy that can help in building a knowledge-based economy in Palestine.

Our conference aims to:

• Foster networking and cooperation between scientists from various disciplines of materials science at Palestinian universities and industries.

• Highlight the latest preparation methods of nanomaterials and their characterization techniques.

• Shed light on the role of material science, nanoscience and nanotechnology in the field of education and the need to involve students in this research.

• Emphasize the role of nanotechnology in the service of the Palestinian community in all fields such as health and environment.

• Strengthen cooperation between the Palestinian and international researchers.

Many people deserve our appreciation and gratitude:

• The conference committee members, technical team and public relations department for their commitment and hard work during the conference preparations.

• The sponsors, as without their invaluable support this conference could not be realized.

Messages

• The authors for submitting their good quality papers and posters.
• The reviewers for reviewing submissions and providing feedback to ensuring a high quality program.

Finally I hope that you will find the conference valuable and enjoy your time in Nablus and also the architectural beauty of its old city. I wish this conference a great success and I will be looking for your recommendations.

Thank you
Prof. Ghassan Saffarini
Conference chairman
Dean of faculty of Science

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In 1986, our factory started in a modest way manufacturing soap from olive oil. Its founder, Zuhair Muhammad Rajeh Yousef Dwaikat, had already graduated as a chemical engineer from Jordan University in 1983. He, by the Grace of Allah, was able to meet the local market's demand of the various types of detergents like shampoos, dishwashing liquids in economy packages, tile and bathroom detergents, chlorine bleach, and washer detergents. Today, the factory occupies a well-kept, two-story building occupying about 1,300 square meters. By the grace of Allah, we recently were able to add additional space by purchasing an adjacent plot bringing up the total area of the factory to 1900 square meters.

Between 2004 – 2006, the factory has been able to add a new unit for producing the special plastic containers used by the factory. This was designed to solve the problem of counterfeiting of Alrajeh's products which harms the factory and its consumers alike. This new unit satisfies about 80% of the factories demand for plastic containers.

Alrajeh Factory added new type of detergents and develop the existing types to cover the wide range of detergent demand by the local markets.

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Email: info@alrajeh.ps

AL ZAHRA FACTORY COMPANY

Al Zahra factory company is a leading manufacturer in food industry, concentrated drinks and cosmetics. It was established in 1965. The company is located in Nablus in Palestine.

The company produces more than fifty products distributed as follows:

neroli water, rose water, apple vinegar, white vinegar, garlic vinegar, lemon juice, starch, acetic acid, sodium bicarbonate, concentrated fruit drinks, cream caramel, jelly, whip topping, cake flour, ground sugar, vanilla, baking powder, corn flour,

	ground rice, custard powder, instant sahlap, coffee whitener, choco, cocoa, cappuccino, food colors , food flavoring, natural oils and medicinal plant-extracts. INDUSTRIAL ZONE, NABLUS, PALESTINIAN NATIONAL AUTHORITY Tel.: + 970 (9) 2311134// 9 2311405/6/7. Fax: + 970 (9) 2311404 e-mail: info@alzahra.ps www.alzahra.ps
	**Omega Raw Materials Drug Store** It has been established in 2005. It is specialized in supplying most of the industries in Palestine with the necessary chemical raw materials in addition to the chemicals necessary for academic purposes. The company supplies the highest quality raw materials for the industry under the best storage conditions supervised by a specialized staff in this field. Contacts: 1-Eng. Ghassan Hazzam (email: galhazzam@yahoo.com) 2-Pharmacist: Rami Joudallah (email: joudallah@hotmail.com) Jerusalem St., NABLUS, PALESTINE Tel: +972 (9) 2316333 Fax: +972 (9) 2316101 Web Site: www.omega-chemicals.com e-mail: info@omega-chemicals.com

Oral Presentations

Growth and Optical Characterization of the Yb-In-Se Thin Films

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Abstract

In this study, the growth and the optical investigations of the Yb-In-Se system are studied by means of scanning electron microscopy (SEM), energy dispersion X-ray analysis (EDXA) and ultraviolet -visible light spectrophotometery. The 300 nm thick Yb-In-Se thin films were prepared by the co-evaporation of the ytterbium metal pieces and the α-In_2Se_3 crystal lumps under a vacuum pressure of 10^{-5} mbar. They were observed to exhibit nanocrystalline nature. The average grain size for this nano-crystals is found to be 27 nm. In addition, the optical transmittance and reflectance measurements have shown that the films exhibit a direct forbidden transition type of energy band gap of 1.07 eV. The optical transitions are associated with interband tail states of 0.25 eV width. Moreover, the dielectric spectra for the Yb-In-Se films which were analyzed in the frequency range of 270-1000 THz, exhibited a maxima at 523 THz. The optical conductivity modeling for these films which was carried out in accordance with the Lorentz model allowed determining the free carrier scattering time and the effective mass, the carrier density, the drift mobility and the reduced resonant frequency as 0.15 (*fs*) and 0.125 m_o, 3.2×10^{19} (cm^{-3}), 2.11 cm^2/Vs and 3.4 x 10^{16} cm^{-1} for the Yb-In-Se films, respectively.

Keywords: Optical materials; Coating; Optical dispersion spectroscopy; Dielectric properties;

Glass Transition and Material Characterization

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Abstract

When a liquid is cooled two distinct solid structures can be obtained. The first one is the well-known crystalline structure meaning, periodicity of the atomic or molecule organization, ordered structure, lowest entropy and lowest volume occupancy. The second one is in reality not so well known, it is the glassy structure meaning, no periodicity of the atomic or molecule organization, disordered structure, excess of entropy, excess of volume leading to have time-dependent physical properties. A crystal is characterized by its temperature of crystallization during cooling and by the temperature of melting during heating. A glass is characterized only by its glass transition temperature.

I propose to discuss the state of the art concerning the actual knowledge of the glass transition temperature determination and I will focus on the classical traps often done by scientists. Then I will show how it is possible to have information about the molecular dynamics occurring around the glass transition domain and how these molecular dynamics can be correlated to local modifications of the glass structures.

Dispersion of Iron Nanoparticles on Clay Materials and its Application for the Sequestration of Aqueous Pollutants

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Abstract

During the last decade, iron nanomaterials have been investigated worldwide for the removal of various inorganic and organic aqueous pollutants. The efficiency of the these materials was documented in lab scale experiments. Field studies (*in-situ* and *ex-situ*) were also conducted and the materials were reported to be successful in the treatment of polluted water and soil. However, one of the major constrains in field applications of iron nanoparticles stems from their strong aggregation tendency.

In order to reduce the aggregation behavior, the particles were synthesized in the presence clay materials, employed as supporting and dispersing agents. Different types of clays and soil minerals were used; kaolinite, montmorillonite, alumina, and clinoptilolite. The resulting composite materials were utilized in the sequestration of aqueous heavy metal ions, ions of rare earth elements, in addition to cationic and anionic dyes, over wide ranges of experimental conditions. High removal percentages and fast kinetics were observed. The primary fixation/removal mechanisms involved redox and sorption reactions, depending on the reduction potential of the particular metal ion. The composite materials were repetitively used and showed high stability.

Study of chain segment mobilities at the interface of semi-crystalline polylactide/clay nanocomposites

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Abstract

This work reports new experimental results focused on polylactide/clay nanocomposites using PBAT as coupling agent [1]. The samples have been accurately characterized by different experimental techniques: XRD, TEM, TGA, standard DSC and MT-DSC with the aim to highlight the effect of lamellae dispersion and distribution at nanoscale onto the thermal features of resulting nanocomposites. We show that the presence of different interaction levels at the interface PLA/OMMT, even tuned by the presence of PBAT, affects both the crystalline phase structure (by differently promoting crystallization of a and a' forms) and the distribution between the amorphous fractions (rigid and mobile). Furthermore, we show that the cooperativity degree obtained from MT-DSC is a powerful complementary tool to X-Ray diffraction and microscopy when investigating the morphology of nanocomposites since it probes the physical interactions between the matrix and the filler. When the dominant morphology of the nanocomposite is exfoliated, the interfacial interactions between the matrix and the filler increase the cooperativity. On the other hand, intercalated morphology renders less effective the formation of physical bonds due to the confinement of the macromolecules in the galleries of fillers, decreasing hence the cooperativity degree.

[1] A. Saiter et al., European Polymer Journal 2016, accepted.

Enhanced semiconductor nano-film electrodes in solar energy conversion: new achievements at An-Najah N. University

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Abstract

Semiconductor (SC) surfaces are useful electrodes in photo-electrochemical (PEC) processes. Solar light that reaches Earth is mostly in visible and infrared regions, with little UV. Thus, metal chalcogenide films with medium band gap (2.4 -1.8 eV; 550 – 700 nm) are heavily investigated. Unfortunately, such SC materials are unstable and degrade under PEC conditions. Therefore, stabilizing them is imperative. In these laboratories, the students' earlier works showed how chemical anchoring metalloporphyrin complexes to monolithic SC (GaAs, Si) surfaces enhanced their efficiency but not the stability. Later on, the students used metalloporphyrin/polymer matrices to enhance both efficiency and stability of these electrodes. Nano-film SC electrodes are being considered as alternative for monolithic SC electrodes due to cost and environmental considerations. Same technique has then been used for nano-film electrodes (CuS, CuSe, CdTe, etc) with known low efficiency and stability. Compared to reported conversion efficiencies in the range 0.5 - 5.0%, the systems described here exhibit very high conversion efficiency values of 14%, 18% and 19% for CuSe, CuS and CdTe films, respectively. Such results have not been preceded by known metal chalcogenide nano-film electrodes. The metalloporphyrin cations are responsible for such enhancement. By lowering the SC flat band edge position, and by speeding up the hole transfer across solid/liquid junction, the metalloporphyrin ions enhanced SC short-circuit current, conversion efficiency and stability. The type of the polymer coating also affects the conversion efficiency. Details of these new findings will be presented together with the model that best explains mode of action of metalloporphyrin ions.

Keywords: Metal chalcogenide nano-films, PEC; solar energy conversion; efficiency and stability enhancement.

Acknowledgments: This work is a continuation of 16 year continued work, with participation from many students and colleagues, whose works were presented earlier. This presentation is focused on recent CuSe, CuS and CdTe film electrodes.

Single thermolysis of phenanthroline-Metal complexes to nanometal oxides

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Abstract
Several types of transition metal ions complexes-with phen and their derivatives were synthesized and characterized by an elemental analysis, UV-Vis, IR, TG/DTA, NMR, CV and single crystal X-ray diffraction.
Some of these complexes were isolated and crystalized as mono- or di-nuclear complexes as seen in Fig.1
Direct thrombolysis of selective complexes, revealed the formation of MO nanoparticle with several cell units.
The new desired metal oxide-nanoparticle material were characterized by UV–vis spectroscopy, IR, SEM, TEM, XRD analysis and PSA as seen in Fig. 1.

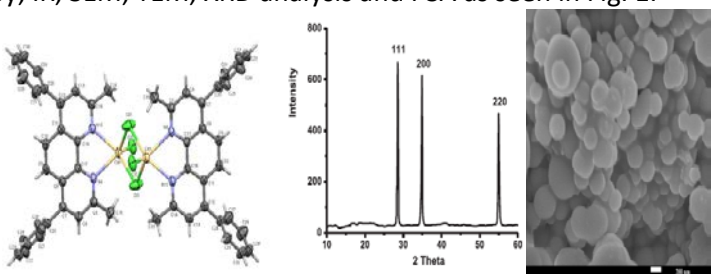

Fig. 1. ORTEP, XRD and SEM of the complex 1 [1].

Keywords: Complexes, XRD, thermolysis, crystal structure.

References

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[3] Synthesis and Characterization of CdO Nanoparticles Starting from Organometalic Dmphen-CdI2 complex A.S. Aldwayyan, et al. *Int. J. Electrochem. Sci.,* 8 (2013) 10506-10514.

Development of compositionally-tuned mixed-garnet crystals for space applications

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Abstract

There are considerable needs in space operations that call for the employment of specific laser sources under mandatory conditions such as high-power, appropriate function wavelengths, flexible lasing and pulse settings, tunability, narrowband, conversion efficiency, laser-beam control, and so on. In areas of space applications such as differential absorption lidar (DIAL), lasers particularly operated around the wavelength peak λ=943nm are recommended key solutions because their spectral emission straightforwardly matches the absorption line of water vapor in the Earth's atmosphere.

In the recent years, and as a result of the aforementioned prerequisites, groups of scientists started conducting central research to develop specific laser materials with valid output gain and efficiency suitable to bring about space constraints and preferences in an optical spectral range of interest. Part of the efforts are focused on the development of compositionally tuned crystals which can be obtained by adjusting the concentration of the host constituents in order to alter the spectral emission and shift it towards a particularly desirable wavelength. Mixed-garnet crystals are innovative materials appropriate for tuning a laser emission in the wavelength range λ=935-945nm. In this class of crystals, lanthanide and rare-earth elements share the structure matrix in proportionalities that are controlled during the crystal growth process.

This presentation reviews the jobs carried out on assorted mixed-garnet laser crystals produced in Italy by the industrial firm FILAR – Opto Materials (FOM), partly in the framework of space activity projects established by the European Space Agency, and partly on market demand based on prerequisite specifications to build up a series of diode-pumped solid-state lasers (DPSSL) with exceptional capabilities. The crystals considered in this study are the Nd-doped mixed-garnet composites GSAG (gallium scandium aluminum garnet), YAG-YSGG (yttrium aluminum garnet – yttrium scandium gallium garnet), and YSAG-GGG (yttrium scandium aluminum garnet – gadolinium gallium garnet).

The presentation reports on the crystal growth of these mixed-garnets, their structural and spectral characterization, fabrication of laser components, and, in some case, laser assessment. Comparison with the properties and performance of Nd:YAG crystals (produced by FOM) will also be enlightened where possible.

Green sustainable method for water and soil purification: Photo-degradation of soil- and water- organic contaminants using semiconductor nano-particles

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Abstract

Different methods and strategies were followed for water and soil purification, the best one is the one with higher efficiency and low cost. Photodegradation is one of the most attractive methods. It involves excitation of the suitable semiconductor by light, before degradation of water or soil organic contaminants occurs. TiO_2 nano- and micro-particles have been used for photo-degradation of widely spread water organic contaminants. Due to its wide band gap (~3.2 eV) TiO_2 photo-catalytic activity is limited to shorter wavelengths only (UV region). As only ~4% of the solar spectrum falls in the UV region, smaller band gap semiconductors (e.g. CdS, with 2.3 eV) are used to sensitize TiO_2 particles. The TiO_2/CdS system has been used as catalyst in water purification by photo-degradation of organic contaminants such as methyl orange and Phenazopyridine (Medically active compound). However, the TiO_2/CdS system is unstable under photodegradation conditions yielding hazardous Cd^{2+} ions. Alternative ZnO nanoparticles naked and substrate to different materials like (clay, sand, and activated carbon) were used in photodegradation process. Also natural dyes (anthocyanin & Curcumine) were used as sensitizer for the TiO_2 nanoparticles. The different prepared nano-catalyst systems were used to photo-degrade various contaminants of water and soil, such as methyl orange, phenazopyridine, paracetamol, phenols, and halo-phenols, with solar radiation. Furthermore, the ZnO nanoparticles were used in water purification and disinfection (from bacteria) by complete mineralization under solar light. Different reaction parameters (such as catalytic efficiency, effects of catalyst concentration, catalyst recovery, contaminant concentration, temperature, pH and complete mineralization) will be discussed.

Keywords: Photodegradation, Nanoparticles, TiO_2, Sensitization, water purification

Synthesis and Investigation of Optical Properties of ZnO Nanorods

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Abstract

One-dimensional nanostructure of length-controlled ZnO nanorods were synthesized by self- assembly process. The ZnO nanorods were assembled from colloidal nanoparticles without surface modification. The as-prepared nanoparticles has spherical shape with size about 3-5 nm, and formed single-crystalline nanorods of length (50-150 nm) and about 16 nm radius. The reaction time parameter plays an important role in the formation process. The morphology and structure of the nanorods were characterized by transmission electron microscopy and X-ray diffraction. Photoluminescence (PL) and UV-visible absorption measurements have been performed at room temperature. The PL results showed that the intensity of ultraviolet (UV) and defect bands depend on the length of ZnO nanorods. The observed intensity variation of ultraviolet and defect band emissions of ZnO nanorods could be used in various colored LEDs and photovoltaic applications.

Keywords: ZnO nanorods, UV-Vis spectroscopy, photoluminescence spectroscopy

Optical interactions in the InSe/CdSi interface

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Abstract

In this work, the structural and optical properties of the InSe/CdSe heterojunction are investigated by means of X-ray diffraction and ultraviolet-visible light spectrophotometery techniques. The hexagonal CdSe films which were deposited onto amorphous InSe and onto glass substrates at vacuum pressure of 10^{-5} mbar, exhibited interesting optical characteristics. Namely, the absorption, transmission and reflection spectra which were recorded in the incident light wavelength range of 300-1100 nm, for the InSe, CdSe and InSe/CdSe interface revealed a direct allowed transition energy band gaps of 1.44, 1.85 and 1.52 eV, respectively. The valence band offset for the interface is found to be 0.36 eV. On the other hand, the dielectric constant spectral analysis displayed a large increase in the real part of the dielectric constant associated with decreasing frequency below 500 THz. In addition, the optical conductivity spectra which were analyzed and modeled in accordance with the Drude theory displayed a free carrier average scattering time of 0.4 fs and drift mobility of 6.65 cm^2/Vs for the InSe/CdSe interface. The features of this interface nominate it as a promising candidate for the production of optoelectronic Schottky channel and as thin film transistor.

Investigation of corrosion inhibition of mild steel in 1M HCl by 3-methyl-4-(3-methyl-isoxazol-5-yl)isoxazol-5(2H)-one monohydrate using experimental and theoretical approaches

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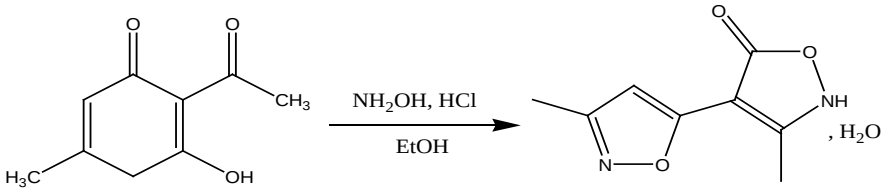
Abstract

The inhibition effect of 3-methyl-4-(3-methylisoxazol-5-yl)isoxazol-5(2H)-one monohydrate (P1) on the corrosion of carbon steel in 1 M HCl was studied by weight loss, electrochemical impedance spectroscopy (EIS) techniques and potentiodynamic polarization methods. The results showed that isoxazole P1 was a good inhibitor in 1 M HCl and inhibition efficiency increases with isoxazole P1 concentration to attain 93% at 10-3M at 308 K. E(%) values obtained from various methods used are reasonably good agreement. The adsorption of isoxazole P1 obeyed the Langmuir adsorption isotherm. Polarization curves showed that isoxazole P1 acted as a mixed-type inhibitor in HCl. The effect of the temperature on the corrosion behavior with addition of 10-3M of the inhibitor was studied in the temperature range 313-343 K, and the thermodynamic parameters were determined and discussed. In addition, a quantum chemical study suggests isoxazole P1 inhibitor is structurally essential for the protection of metal surface



Scheme 1: Characterization of 3-methyl-4-(3-methylisoxazol-5-yl)isoxazol-5(2H)-one monohydrate (P1).

Key words: Mild Steel, EIS, Polarization, Weight loss, Acid inhibition, adsorption isotherm, DFT.

Speciation Analysis of Nano Quantities of Antimony in Environmental Samples Using Isotope Dilution Method

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Abstract

In this study a novel method was developed to determine the distribution of Sb and Sb species (Sb III and Sb V) in soils and grass samples in a roadside profile. The Sb species distribution after the chromatographic separation was determined using on-line isotope dilution after their extraction from a contaminated soil sample using 100 mmol L^{-1} citric acid. The separation of Sb(III) and Sb(V) was achieved using an anion exchange column (PRP-X100) and 10 mmol L^{-1} EDTA, 1 mmol L^{-1} phthalic acid at pH 4.5 as a mobile phase. After optimization, the extraction procedure for inorganic Sb species 6% Sb(III) (1.3% RSD, n=3) and 43.2% Sb(V) (2.9% RSD, n= 3) as percents of total Sb were detected in the examined soil sample using on-line ID after coupling the HPLC to ICP-MS. The detection limits achieved by the proposed method were 20 ng L-1 and 65 ng L-1 for Sb(V) and Sb(III), respectively. The precision, evaluated by using RSD with 100 ng L-1 calibration solutions, were 2.7% and 3.2% (n=6) for Sb(V) and Sb(III), respectively in aqueous solutions.

Finally, after the development of a suitable speciation analysis method, the procedure was applied successfully for the first time to study the inorganic antimony species distribution in soil and grass samples profiles taken at different locations from traffic roads edges. Emissions from vehicles are the most common and important anthropogenic source of Sb in environment. Correlations between magnetic susceptibility data for roadside samples and inorganic Sb species were observed. Very interesting environmental interruptions were obtained concerning the antimony species distributions Sb(III) and Sb(V).

Characterization of nanomaterials with low voltage field emission scanning electron microscopy: Promises and challenges

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Abstract

Use of materials in the form of thin films, layers, coating, nanowires, nanotubes, and nanoparticles is increasingly deployed in many industries. Application varies from semiconductors to memory or optical devices, to catalysis, corrosion, as well as many artistic, chemical, electronic and biomedical fields. In this communication, I report on two years of consulting research work at Agilent Technologies Inc., using the Agilent 8500 Field Emission Low Voltage Scanning Electron Microscope. This scope allows imaging of most types of materials: metals & alloys, minerals & rock, ceramics, semiconductors, polymers, and biological samples, as well as micro- and nano-devices (PV-cell, MEMS, AFM-cantilever, dynamic memory, etc.). It provides images of 5-10nm resolution without the need for sample coating (usually done with Au, C, or Au-Pd in conventional SEMs). The imaging is done at a standard accelerating voltage (AV) of 1000v instead of the conventional voltage of 15-35kV. This low voltage avoids analyst also the charging effects and the radiation damage that may result with insulating specimens from the higher AC or the damage to biological specimens when imaged with and an Environmental Cell Scanning Electron microscope (E-SEM). Data to be presented concern a
wide range of materials and address multiple questions on the nature, structure, and application/occurrence of these materials in different contexts (engineering, geological, archaeological or artistic). Major focus shall be given to materials at the nanoscale level.

Investigation of the Properties of Different Types of MWCNTs Polymer Composites

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Abstract

Multi Walled Carbon Nanotubes (MWCNTs) nanocomposites due to their tunable ability play a major role in numerous applications. Some of these are: electromagnetic interference (EMI) shielding, radar absorption materials (RAM), electrostatic painting for car body panels and mirror housings, electronic components and elastomers, airplane tire for antistatic dissipation, capacitors for charge storage, on-body antenna design and satellite and automotive applications.

Carbon Nanotubes (CNTs) and, in particular, Multi Walled Carbon Nanotubes (MWCNTs) is used intensively as a filler in a variety of polymers. Their outstanding mechanical, electrical, and thermal properties allow them to enhance the properties of the material in which they are used as filler for matrix reinforcement. Also, this increase in performance takes place even at low percentages of MWCNTs.

The realization of nanocomposites filled with various types of MWCNTs, and their electrical characterization for DC and microwaves frequencies are studied. Various samples of nanocomposites based on different polymers filled with different weight fractions of MWCNTs inside polymer matrix are prepared. The dispersion of MWCNTs inside the polymer is a crucial point for samples homogeneity and can effect on their electrical characterizations. The dispersion of MWCNTs inside polymer matrix is investigated by Field Emission Scanning Electron Microscopy (FESEM) analysis.

The Nanocomposites resistivity is measured by a two point probe (TPP) method. The complex permittivity is measured in the frequency band (200MHz-20GHz) by using a Network Analyzer (E8361A) and a commercial coaxial open-ended probe (Agilent 85070D). The relationship between MWCNTs physical dimensions and the complex permittivity values of the Nanocomposites is investigated.

Thermo-oxidative decomposition of quinolin-65 as an asphaltene model molecule

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Abstract

Asphaltenes is considered the heaviest, most aromatic and most surface-active fraction of crude oil. Because of their complex chemical structures, amphiphilic behavior, and polarizability asphaltenes exhibit a self–associating feature that promotes aggregation and subsequently increases the viscosity of crude oil. NPs have unique properties which allow them to be promising solutions to problems involving asphaltenes.

However, because of the complexity of asphaltenes, the understanding of their properties, in particular the structural factors ruling their self-association and subsequent adsorption and cracking tendencies are difficult. Hence, a model molecule, Quinolin-65 (Q65), which mimics the properties of asphaltenes, has been proposed to improve our understanding of asphaltene chemical behavior in the presence of NiO nanoparticles. The model molecule chemistry is studied using high-level of computational modeling. Thermo-oxidative behavior of O65, in the presence and absence of nanoparticles, is investigated experimentally and theoretically. Thermogravimetric analysis (TGA) was carried out using a simultaneous thermogravimetric analysis/differential scanning calorimetry (TGA/DSC) analyzer to probe the product gases during the thermo-oxidative process. Density functional theory (DFT) and the second-order Møller–Plesset (MP2) perturbation theory were employed to explore the reactions involved in the thermal decompositions as well as the interactions between the model molecule and singlet atomic ($O\ ^1D$) and molecular ($O_2\ ^1\Delta$) oxygen.

Both, the theoretical study and the thermogravimetric analysis, concluded that the thermo-oxidative decomposition of Quinolin-65 is a complex multi-step reaction process, which involves different reaction pathways. The thermodynamic parameters obtained in this study showed that the reaction process should start with the loss of the olefin chain in the Quinolin-65 molecule, followed by the oxidation of the aromatic chain, to produce mainly, H_2O, CO_2, and SO_2.

The significance of this work lies in the fact that the thermodynamic parameters obtained, ΔG in particular, are highly endogenic, including those involved in the formation of singlet oxygen. In addition, and because of the complexity and size of the Q65 molecule, its oxidation reaction mechanism suggests slow and tough reaction pathways, which strongly suggests the need for a catalyst.

Synthesis of sulfur nanoparticles and their antibacterial activities

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Abstract

Different methods were used for Sulfur nanoparticles (S NPs) synthesis; among those, chemical precipitation, electrochemical method, micro emulsion technique, composing of oil, surfactant, co-surfactant, aqueous phases with the specific compositions and ultrasonic treatment of sulfur-cystine solution. In this work S NPs were prepared by a quick precipitation method using sodium thiosulphate and tetraoctylammonium bromide surfactants in conc. hydrochloric acid media [1].

The sizes and shapes of S-NPs were confirmed by scanning electron microscope (SEM), transmission electron microscopy (TEM) and X-ray diffraction (XRD) techniques, Figure1.

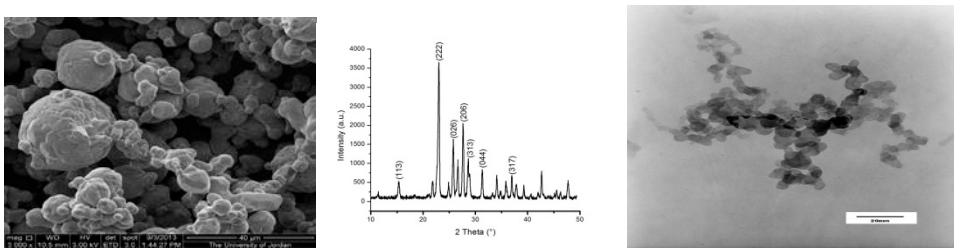

Figure 1. SEM micrographs, XRD pattern, TEM micrographs of S NPs.

Broth micro-dilution method was applied to determine antibacterial activity of S-NPs against Staphylococcus aureus, Escherichia coli and Pseudomonas aeruginosa reference strains. S-NPs exhibited antimicrobial activity (MIC = 5.47µg/mL) against Staphylococcus aureus strain (Gram-positive bacterium). On the other hand, no antimicrobial activity was detected against Gram-negative bacteria isolates (Escherichia coli and Pseudomonas aeruginosa) at0.68 to800 µg/mL.

Keywords: Sulfur Nanoparticles (S-NPs), TEM, SEM, XRD, Antimicrobial activities.

References:

[1] M. Suleiman, A. Al Ali, A. Hussein, B. Hammouti, T.Hadda, I.Warad. (2013) Sulfur Nanoparticles: Synthesis, Characterizations and their Applications. *J. Mater. Environ. Sci., 4, 1029-1033.*

The use of nanotechnology techniques to make $In_xGa_{1-x}N$ multijunction with up to 40% photovoltaic efficiency

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Abstract

The oil shortage in the medium term as well as the environment deterioration concern push researcher to explore new sources of energies. Photovoltaic (PV) solar energy conversion remains a clean and an easy to use converter, but efficiencies are low and cell prices are very high. Enhancing the efficiencies with using the same amount of material and the same area may solve the problem. A p-n junction solar cell can convert only a part of the solar spectrum with energy which is greater than the gap at the barrier. Rainbow cells could contain enough junctions in series with different gap energies to convert all the colors of the solar spectrum. Indium Gallium Nitride alloys $In_xGa_{1-x}N$ have energy gaps lying between 0.7 eV and 4.2 eV. Thus, if used for photovoltaic applications, they can lead to realize tandem cells with a greater number of junctions and could so eventually absorb most of the solar spectrum.

In this frame, we carried out research on multijunction solar cells. The simulations of $In_xGa_{1-x}N$ structures under solar illumination permit the optimization of the geometrical dimensions and electrical properties of the materials. This paper presents the results of the simulations, which show that we can reach 40% efficiency with GaInN rainbow PV cells if we stack six junctions together. Classical ways have been used worldwide to make these structures but did not succeed to make good cells. We propose to use nanotechnology technique to solve the problems of manufacturing.

Development of Innovative Low Cost POF Sensors for Monitoring Chemical and Environmental Quantities

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Abstract

This work aims at the design and development of innovative sensing systems based on optical technology. Plastic Optical Fiber (POF) can be successfully employed for the development of highly sensitive and selective devices to be used in monitoring environmental and chemical quantity. This paper describes an approach to develop low-cost plastic optical fiber sensors suitable for measuring low concentrations of pollutants in the atmosphere, such as low concentrations of hydrogen fluoride (HF) vapors. The sensor is based on plastic optical fibers whose surface is modified in such way to make it sensitive to the presence of specific contaminants (below to 0.1 ppm of HF). The approach proposed for the realization of the sensors foresees the surface modification of the plastic optic fiber in three steps: (i) removing of the cladding by an organic solvent (such as ethyl acetate); (ii) performing a plasma nanotexturing of the core surface using oxygen/argon plasma treatments (iii) deposition of the sensitive thin film (SiO2) able to react with HF by using PECVD (Plasma Enhanced Chemical Vapor Deposition) and/or plasma sputtering. The pollutants (fluoride ions) attack the SiO2 film and alter the transmission capability of the fiber so that the detection simply requires a LED and a photodiode. The sensor exploits a cumulative response which makes it suitable for direct estimation of the total exposure to the fluoride ions.

Review on the Science and Technology of Water Desalination by Capacitive Deionization and Demineralization

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Abstract

One of the most environmental friendly technique for water purification is electrochemical techniques like capacitive deionization ttechnology (CDI). Water with different species like anions, metals and other contaminants is introduced to an electrochemical cell to purify it from contaminants including salt. During polarization, ions are electrostatically removed from the water and adsorbed in electric double layers at the surfaces of electrodes. The output of this process is cleaned water without contaminants.

CDT with carbon aerogel considered to be a new and famous technique where 80% of saline water transferred to pure water with low energy consumption, without producing pollutants like NO_X, SO_2, or other volatile organics.

This experiment based on applying current with two anions, Na^+ and Cl^- which distributed between the two electrodes of carbon aerogel which they have high surface area.

The absorption of NaCl by the aerogel carbon electrodes reached more than 50% by varying the experimental parameters like voltage, pH, concentration, distance between electrodes and flow. The best conditions were using: 2V, pH =5, and a 0.4 cm distance between electrodes. When the distance between electrodes decreased the absorption of ions increased due to the formation of electrical double layer and increasing potential between electrodes. For the best removal results a flow of 80 mL/min was used. From our results we can conclude that using capacitive desalination technology (CDI) enhanced the removal of salts from brackish water.

Single walled carbon nanotubes-Ciprofloxacin nanoantibiotic: Synthesis, characterization and antibacterial activity

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Abstract

Despite the modern medicinal chemistry in designing new therapeutic agents by using different new innovative techniques in molecular modeling and combinatorial chemistry, beside to their expensive cost, infectious diseases continue to be one of the greatest health challenges worldwide. The main disadvantages for conventional antibiotics are the development of multiple drug resistance and adverse side effects. Recent advancement in nanotechnology has expanded our ability to design and construct nanomaterials with targeting, therapeutic, and diagnostic functions. Among nanotechnology-derived materials, carbon nanotubes have stimulated a great interest for biomedical applications because of their unique mechanical, electrical, thermal and spectroscopic properties.Nevertheless, advances in these directions have been hampered by the insolubility of CNTs in most solvents, and most importantly in water where they exist as ropes and large bundles. To overcome these problems we have recently development various approximations for the water solubilzation of SWCNTs.

So, here we aim to develop a new nano-antibiotic based on carbon nanotubes by functionalizing them covalently with Ciprofloxacin antibiotic and proposing that the large surface area of CNT and/or this new nano-prodrug will prevent the bacteria to throw them out once they penetrate the membrane.

In this communication, the full synthesis of the nanoantibiotic will be presented by the covalent functionalization of SWCNTs. A full characterization by TEM, SEM, TGA and Raman spectroscopy have been conducted in order to determine the morphology, size and the quantity of the functionalized SWCNTs. Finally, the antibacterial activity has been determined on three different strains E. coli, S. aureus, P. aeruginosa obtaining a better activity in comparison to the ciprofloxacin antibiotic alone. This study will open the door to develop nanoantibiotic with ease synthesis and low cost with an efficient and effective manner to have a powerful antibacterial activity to the existing antibiotic.

The Risk of Ionizing Radiation Arising from Waste on Workers at Regions in Some landfills in West Bank

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Abstract

The study sample consists of 74 workers who were chosen randomly from different seven landfills in West Bank.

In this study, Gamma dose equivalent rate and Beta particles flux density were measured. In addition, the health parameters were measured to study the effect of ionizing radiation which arises from waste on landfill workers.

The measured Gamma dose equivalent rate ranged from 0.26 mSv/y to 3.50 mSv/y for all landfills. Two of the landfills have values above the international standard value which is 1 mSv/y. The measured Beta dose equivalent rate ranged from 0.01 mSv/y to 0.73 mSv/y for all landfills, which is below the international standard value.

Measurements of arterial blood pressure (systolic and diastolic), tympanic temperature, heart pulse rate and blood oxygen saturation showed a change before and after exposure to ionizing radiation, but this change is in the normal human range.

Formulation and Characterization of Sustainable Oil Microemulsions and their application in Biofuel

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Abstract

Nowadays there is a great focus on maintaining the environment and thinking about ways to reduce the harmful gases that are released daily into the atmosphere, as a result of the petroleum products burning. Also there is a lack of energy sources such as, petroleum and its derivatives. So, we must find alternatives depending on natural products as renewable energy source which does not harm the environment and reduces air pollution.

Microemulsion-based fuels in the presence of water in a thermodynamically stable microemulsion can successfully be used to reduce soot formation. When water is vaporized during the combustion, this will lower the heat released and the combustion temperature. As a direct consequence, the emission rate of gases like nitrogen oxides (NOx) and carbon monoxide (CO) will decrease. Fuel microemulsion consisting of four-component systems, lemon and diesel as oil phase /sucrose laurate (C-1216) , (C-1205) as sugar ester nonionic surfactant/pentanol , propanol and ethanol as co-surfactant and water, were studied.

Ternary phase diagrams, determined at 25°C, show large isotropic single-phase nano-structured microemulsion regions and small anisotropic liquid crystal regions.

Synthesis and characterization of metal-doped humidity sensors based on hematite for environmental monitoring applications

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Abstract

Humidity sensors have several applications in both industrial processing and environmental control. Pure and doped hematite have proved to exhibit a remarkable humidity sensing properties. The aim of this investigation is to study the effect of doping of some metal ions (Li^{+}, Mg^{+2}, Ba^{+2}, Sr^{+2}, and Na^{+}) onto the crystalline hematite and to determine their sensitivity towards relative humidity (RH). The obtained crystalline samples were characterized by particle size distribution, X-Ray Diffraction (XRD) combined with Field Emission Scanning Electron Microscopy (FESEM).

Sensors were screen printed onto an α- alumina substrates with platinum electrode followed by Screen printing of doped α-Fe_2O_3 powders and a binder for the appropriate rheological properties to the paste. After deposition samples were dried in air at room temperature prior to be heat treated at 800°C for 1h. Humidity sensors were tested in a laboratory apparatus made of a thermostated chamber, operated at 25°C, in which relative humidity (RH) could be varied between 0 and 96%.

The doped sodium metal ions (Na^{+}) hematite sample showed a significant response towards relative humidity at room temperature.

Generalization of Faraday's law of induction: some examples

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Abstract

A general form of the induced electromotive force due to time-varying magnetic field is derived. It is shown that the integral form of Faraday's law of induction is more conveniently written in the covering space. The method used in this work relies of finding the modified magnetic field each time the circular path is traversed. This amounts to an additional time derivative of the magnetic field. Therefore, the induced electromotive force comes from the sum of all contributions coming from all winding numbers. Thus the differential form is shown to relate the induced electric field in the n^{th} winding number to the $(n+1)^{th}$ time- derivative of the magnetic field. It is also shown that the higher order terms are modulated by the self-inductance and resistance of the circuit. Some illustrative examples for time-dependent magnetic fields are presented: Sinusoidal, exponential, and step-function fields. In each of these examples, it is shown that the induced electromotive force could be written in closed analytical form that depends (among other things) on the ratio between the self-inductance and resistance of the circuit. Furthermore, in all these examples it is demonstrated that our result for the induced electromotive reduces to the well-known result in the limit of the ratio of the self-inductance and resistance goes to zero. The conclusion of this work shows that Maxwell's equation of Faraday's law of induction can be written in a more general form in the physical space.

Energy spectra of double quantum dot by variational calculations

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Abstract

The eigenenergies of two electrons confined in double quantum dot structure had been obtained by solving the Hamiltonian using the variational method. The Hamiltonian is modeled as a sum of two electron parabolic quantum dot Hamiltonians coupled with a Gaussian potential barrier of finite width and height .We had shown the transitions in the angular momenta of the ground states of the double quantum dot spectra as a function of magnetic field. The singlet-triplet splitting as a function of magnetic field and barrier height is also displayed. Our results computed by variational method are tested against other reported numerical ones.

Elaboration and characterization of modified sepiolites and their humidity sensing features for environmental monitoring

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Abstract

After a simple low cost wet chemical precipitation route under basic conditions and subsequent thermal treatment, different oxide/hydroxide nanoparticles (based onW^{4+}, Co^{2+}, Cu^{2+}, Gd^{3+}, La^{3+}, Mn^{2+}, Nd^{3+}, Sm^{3+}, Sr^{2+}, Y^{3+} and Zn^{2+}) were formed instead of Mg^{2+} ions onto the sepiolite ($Si_{12}Mg_8O_{30}(OH)_4.(H_2O)_4.8H_2O$) channels. The fact that these nanoparticles appear supported on an inert matrix makes it possible to avoid manipulation, agglomeration and harmful character that pure nanoparticles usually have.

Thermogravimetric–Differential Thermal Analysis (TG–DTA) combined with X-ray diffraction (XRD), nitrogen adsorption at −196 °C, Field Emission-Scanning Electron Microscopy (FE-SEM), Diffuse Reflectance UV–visible (DR-UV–vis) spectroscopy and Infra-Red (IR) spectroscopy were used to study the particle size distribution, the morphology and the composition of the modified sepiolites.

Sepiolite is known as a high specific surface area (SSA), that is why the thinking about using in sensors is a must. SSA decreases after leaching of sepiolite, whereas, after doping, some oxo/hydroxides formed, as confirmed by UV–vis spectroscopy that could contribute to the increase in SSA.

Humidity sensors were prepared in the form of pellets, where powders uniaxially pressed and thermally treated at 550 °C for 1 h then, interdigidated (IDE) gold electrodes were screen-printed.

Among the investigated compositions, tungsten-doped sepiolite seems to be the most interesting one, even, if its composition has to be optimized, in order to have responses for lower RH values. This is due to response towards relative humidity (RH) at room temperature starting from 40% RH.

In a future work, different amounts of precipitated particles will be investigated.

Application of Nanotechnology in Cancer Therapy: A General Overview

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Abstract

Cancer has increased in the last years, and is becoming a major public health problem in Palestine and many other parts in the world. According to the WHO, Cancer is a leading cause of death worldwide, accounting for 8.2 million deaths in 2012 and it is important to mention that tens of million dollars is spent annually on the treatment of cancer cases locally and abroad. However, drug toxicity and tumor resistance of the traditional chemotherapy are two of the main challenges associated with the traditional anticancer drugs. Toxicity can cause fatal consequences such as heart or bone marrow toxicity that lead to the cessation of the treatment. Moreover, the development of drug resistance by tumors in a lot of cases causes the failure of the treatment. Therefore, there is a huge demand to develop a new strategy to fight this lethal disease. One of the promising approaches is the targeted nano-medicine to fight cancer. Nanomedicine has shown obvious benefits in comparison to the traditional chemotherapy such as increasing the targeting efficacy, enhancing permeability and retention, improving the half-lives and consequently decreasing the side effects.

Therefore, in this overview different aspects will be discussed:

1. An overview of solid tumors and their characteristics.
2. The drawbacks of conventional chemotherapy.
3. The huge advantages of nanomedicine in fighting cancer in comparison to traditional cancer treatment.
4. The new approaches in drug and gene deliveries and their benefits in cancer therapy.
5. Challenges and opportunities.

Carvedilol-loaded poly(D,L) Lactide nanoparticles/ microparticles : Preparation, Characterization and drug release profile

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Abstract

The oral solid dosage forms are the most preferred among other dosage forms because they offer some advantages such as the ease of administration with a high patient compliance, the ease to prepare, transport with high store stability and the low cost of manufacturing processes.

Beside of these advantages, the conventional drug release dosage form suffers from various inconvenient that offer many challenges for pharmaceutical industries. Two important factors responsible for these inconvenient are 1) the immediate release of the drug, with little or no control upon the release rate and also 2) their low solubility and/or permeability. One promising method, is the utilization of biodegradable polymer nanoparticles in drug delivery to overcome the disadvantages mentioned previously in the developing of oral solid dosage form. This technology has shown to enhance the solubility and hence; absorption of poorly water-soluble drugs; efficiently target drugs into distant areas in the body; enhance cellular uptake of drugs across tight epithelial and endothelial barriers; deliver two or more drugs using the same carrier.

Carvedilol, is an anithypertensive agent that is used widely in the treatment of hypertension and congestive heart failure. However, it suffers from low water solubility which will decrease its oral bioavailability. In this work we aim to prepare Carvedilol poly (D,L) lactide (PDLLA) nanoparticles/microparticles with high loading efficiency and to optimize the size and morphology of the developed particles in order to study the Carvedilol release profile from the obtained particles at room and body temperatures.

In this communication, the preparation of the PDLLA nanoparticles and microparticles and their loading with Carvedilol will be presented. A full characterization of the obtained particles by AFM in order to optimize their size and morphology will be discussed. Finally, the Carvedilol release profiles from the PDLLA nanoparticles and microparticles have been determined at room and body temperatures.

Complexes formed between DNA and poly(amido amine) dendrimers of different generations

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Abstract

Gene therapy holds a promise in healing cancer and other genetic diseases by directly delivering therapeutic DNA into living cells. Although viruses have been demonstrated to be efficient delivery vectors, their toxicity and immunogenicity have limited their general use. Poly (amidoamine) (PAMAM) dendrimers, being protonated under physiological conditions, have great potential as nonviral vectors for gene transfection. Many experimental and simulation studies have been performed to study the effect of dendrimer size, charge, and salt concentration on the structure and transfection efficiency of condensed DNA aggregates. In our study we investigated the complexation of dendrimers with DNA molecule using theoretical model and Coarse-Grained molecular dynamics simulations.

Throughout the study, first we emphasized on the effect of the medium's environments on the complexation of LPE chain with one dendrimer, namely the concentration of 1:1 salt solution, dielectric permittivity of the solvent, and pH conditions. Other factors have been investigated such as size and charge of the dendrimers, degree of polymerization of the LPE chain, and it's rigidity. Then we investigated the effect of the salt concentration on the interaction between linearized DNA plasmids (4331 bp) and positively charged dendrimers of generations 1, 2, 4, 6 and 8, previously studied experimentally. It is found that in the first case of complexation of LPE chain with one dendrimer, the wrapping degree of the chain around the dendrimer increases by increasing dendrimer's charge, Bjerum length, length of the LPE chain, and salt concentration. Also, charge inversion of dendrimer is obtained, and the value of the inverted charge increases by increasing the above mentioned parameters. While the complex shows more wrapping degrees, and less inverted charge as the pH of the solution decreases.

In the case of complexation of DNA plasmids with dendrimer of different generations, the wrapping length of the LPE chain depends on dendrimer generation. With small generations, the optimal wrapping length of LPE chain around dendrimer increases by increasing the salt concentration, while, the complexation is insensitive to ionic strength with large generations.

Application of Packed-Bed Emulsification System for preparation of Polymer Microcapsules and Double Emulsion

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Abstract

Polymer microcapsules and double emulsions (emulsion in an emulsion) are widely applied as micro drugs vehicles for controlled release of drugs and bioactive compounds in the body. Several emulsification techniques can be used for preparation of microcapsules and emulsions including high pressure homogenizers, sonication and membrane emulsification.In the present study, the microcapsules and double emulsions are prepared using relatively new premix emulsification method that consists of a packed bed column loaded with glass beads of different sizes (30-90 µm) at various bed heights (2-20 mm). The emulsification procedure starts with preparing a coarse and polydisperse premix emulsion that is then pressurized through the porous media of the packed bed several times. The passage of the large droplets through the pores breaks them up into smaller and more uniform droplets. The transmembrane fluxes recorded with this technique (100-1000 $m^3/m^2 \bullet h$) were much higher than other membrane emulsification techniques.The size of the microcapsules were 2-10 times smaller than the interstitial voids of the bedswith an average microcapsules size of about 2-8 µm with an average span of ~1. Besides, the effect of the transmembrane pressure, bead size and bed height on the size and span of the microcapsules and droplets was investigated. The results showed that the size of the microcapsules and droplets decreases with increasing the bed height and bead size.

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Electrochemical properties of Sol-gel WO_3 films single doped with Ti and Co-doped with Ti and Zn

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Abstract

WO_3 nanoparticles single doped with Ti ($W_{1-x}Ti_xO_3$) and co-doped with Ti and Zn ($W_{1-x}Ti_{x-y}Zn_yO_3$) have been prepared, onto FTO/glass substrate. Preparation of films was done using wet chemical method (dipping in a sol-gel). The molar concentration of Ti into $W_{1-x}Ti_xO_3$ ranges from 0-30 % in steps of 5%. Best electrochemical and electrochromic properties were observed for composition that has Ti nominal concentration of 5 % ($W_{0.95}Ti_{0.05}O_3$). This was evidenced from measurements of cyclic voltammetry (CV), chronoamperometry (CA), and transparency during CA. The composition that gives best electrochemical and electrochromic properties ($W_{0.95}Ti_{0.05}O_3$) was used to prepare WO_3 nanocrystallite films co-doped with Zn for the first time ($W_{0.95}Ti_{0.05-y}Zn_yO_3$). The Zn molar concentration in these films varied from 1-5%. From CV, CA, and transparency measurements, the best electrochemical and electrochromic properties were observed for films that contains 3% of Zn ($W_{0.95}Ti_{0.02}Zn_{0.03}O_3$). Moreover, this film was found to have better electrochemical and electrochromic properties than single doped WO_3 film ($W_{0.95}Ti_{0.05}O_3$). In addition, higher electrochemical stability was observed for co-doped films.

Modifying PEC characteristics of CuS thin film electrodes prepared by electrodeposition: effect of cooling rate and coverage with electroactive composite materials

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Abstract

Binary compound semiconductors of CuS were grown on FTO/glass substrates by electrodeposition method. The prepared films were then covered with tetra(-4-pyridyl)porphyrinatomanganese(II/III) sulfate (Mn^{II}MTPyP & Mn^{III} TPyP) embedded into a polyethylene polymer matrix. The covered films were annealed under nitrogen and used for a photoelectrochemical study in aqueous electrolyte solutions for the first time. Effects of pre-annealing temperature (150, 250 and 350 ^{o}C), cooling rate, annealing time, and using different aqueous electrolytic systems, of the covered thin film electrodes, on their photolumenescence spectra, electronic absorption spectra, dark J-V plots, photo J-V plots, conversion efficiency and value of short-circuit current, have been studied. The modified electrode surfaces were more stable to degradation in the dark and under illumination than the unmodified ones. Furthermore, the modified electrodes showed higher light-to-electricity conversion efficiency than the unmodified ones. Based on this study, it is strongly recommended to pre-anneal CuS films and cover them with MnP/PE matrices before using them in PEC processes.

Keywords: CuS, thin film, electrodeposition, annealing, cooling rate, PEC, efficiency, stability.

XRD investigations of *α*-polyamide 6 films: orientation of nano-crystallites and structural changes upon uni- and biaxial drawing

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Abstract

We have investigated the influence of drawing on orientation, crystallinity, and structural properties of polyamide 6 films using X-ray diffraction (XRD). The samples were uniaxially and biaxially stretched resulting in the formation of monoclinic nano- crystallites (α-form) in the size range of 8–10 nm. Depending on the drawing ratio, a degree of crystallinity of up to 60% is obtained. The average orientation of the crystallite axes was evaluated using the pole figure technique. The b*-axis, which corresponds to the chain direction of the polyamide molecules, lies in the film plane and shows a preferred orientation upon drawing. For uniaxial drawing, b* aligns with the drawing direction. For biaxially drawn films, which were prepared using the sequential stretching method, the second drawing determines the orientation of b*, at least at the
center of the films. At the sides, b* is located between the two drawing directions reflecting the inhomogeneous distribution of mechanical stress during stretching.

Electronic, structural, and magnetic properties of TbO under pressure: FP-LAPW study

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Abstract

Using the framework of the density functional theory (DFT), we have calculated the electronic, magnetic and structural properties of TbO in rocksalt (RS), cesium chloride (CsCl), and zincblende (ZB). Full potential linearized augmented plane wave (FP-LAPW) method within the local spin density approximation (LSDA) and generalized gradient (PBE-GGA) approximations are used. Magnetic and nonmagnetic (NM) calculations are performed and a modified version of Becke and Johnson (mBJ) exchange potential has been used to calculate the band gaps. We found that though TbO is stable in a ferromagnetic (FM) state, it is stable in rocksalt phase at ambient condition. Both LSDA and PBE-GGA calculations revealed that the three structures are metallic. However, using the mBJ calculation, it is clear that RS and CsCl phases of TbO compound are metallic, while ZB phase is found to be an insulator in the spin up case and a semiconductor in the spin down case at ambient pressure.

Nano structured microemulsion and co-crystallization of lactic acid and salicylic acid as topical drug

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Abstract

This study aims to prepare topical salicylic acid and lactic acid microemulsion with a different formulation applied using the minimum amount of Tweens. The sugar surfactant used in this study is sorbitan monooleate (Tween 80). Short chain alcohol used as a co-surfactant which is propylene glycol. The oil phase used is castor oil. The aqueous phase is purified water. Also this study aims to prepare a co-crystal paradigm between salicylic acid and lactic acid as the active pharmaceutical ingredients, in presence of using different co-solvents.

In this research, we studied the effect of different percentage of surfactants on the phase behavior of the systems suggested at different temperatures 25, 37 and 45°C. We also explored the effect of adding co-surfactant (propylene glycol) on the phase behavior. The addition of propylene glycol as a co-surfactant contributes clearly in forming much smallest and stable micro emulsion droplet size besides giving pliability to the infected skin. Lastly the phase behavior of sorbitan monooleate was studied as a function of temperature and surfactant concentration; that is presented in the form of the well known phase diagram that shows an isotropy microemulsion solution (using visual inspection, cross polarizer and dynamic light scattering) as low as 4% water addition at all temperatures (25˚C, 37˚C and 45˚C).

Also in this research, we studied the ability of different co-solvents used in the formation of co-crystal paradigms, such as ethanol (96%), methanol (99%), diethyl ether and acetonitrile either in reflux or grinding techniques. The co-crystal paradigm was obtained in all reflux techniques applied successfully; more than 80% from the grinding technique of the samples obtained creates a merged compound successfully. All paradigms are tested using Fourier Transform Infra-Red spectroscopy (FTIR) and the melting point range is tested for part of them. The co-crystals obtained were tested for solubility modifications and the results show a clear change in their solubility to be sparingly soluble to soluble in water. Also the co-crystal solids were tested for their melting point and the variation change observed is dependent on the target active pharmaceutical concentration and depending on the molar ratio for each co-crystal tested. But even so the melting point was changed to be lower than pure salicylic acid melting point and higher than lactic acid.

Poster Presentations

Kinetics and synthesis of Ag_2O nanoparticles by calcination and γ-irradiation of silver acetate

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Abstract

Kinetic studies for the non-isothermal decomposition of unirradiated and γ-irradiated silver acetate with 10^3 kGy total γ-ray doses were carried out in air. The results showed that the decomposition proceeds in one major step in the temperature range of (180–270 °C) with the formation of Ag2O as solid residue. The non-isothermal data for un-irradiated and γ-irradiated silver acetate were analyzed using Flynn-Wall-Ozawa (FWO) and nonlinear Vyazovkin (VYZ) iso-conversional methods. These free models on the investigated data showed a systematic dependence of Ea on γ indicating a simple decomposition process. No significant changes in the thermal decomposition behavior of silver acetate were recorded as a result of γ-irradiation. Calcinations of γ-irradiated silver acetate (CH3COOAg) at 200 °C for 2 hours only led to the formation of pure Ag2O mono-dispersed nanoparticles. X-ray diffraction, FTIR and SEM techniques were employed for characterization of the synthesized nanoparticles

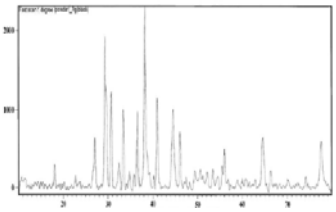

Fig 1. XRD pattern for synthesized silver oxide NPS.

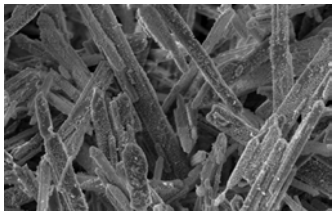

Fig. 2. SEM image of sliver oxide NPS.

Keywords: non-isothermal decomposition; γ-irradiation; silver oxide; nanoparticles

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Gracilaria bursa-pastoris as eco-friendly corrosion inhibitor for mild steel in 1 M HCl media

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Abstract

This work describes the successful performance of Gracilaria bursa-pastoris as an eco-friendly corrosion inhibitor for mild steel in HCl 1M solution. This study investigated by weight loss measurement, electrochemical impedance spectroscopy (EIS) and Tafel polarization. The inhibition mechanism is discussed considering thermodynamics of adsorption and kinetics of the electrochemical reactions. Gracilaria bursa-pastoris is a mixed-type inhibitor and the mode of inhibition results from the geometric blocking effect of physisorbed inhibitive species at the metal surface.

(a) **(b)**

Figure 1: Gracilaria bursa-pastoris, a) plant, b) powder

Key words: Mild steel, Gracilaria bursa-pastoris, Plant, HCl, Corrosion, Green inhibitor.

Electrical properties of the Yb/Ga_2S_3 interface

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Abstract

Ga_2S_3 thin films are deposited onto Ytterbium substrate at vacuum pressure of 10^{-5} mbar for use as new class of optoelectronic devices. The Yb/Ga_2S_3 interface is studied by means of current- voltage characteristics, impedance spectroscopy in the frequency range of 1.0 M-1.8 GHz and the power spectroscopy in the frequency range of 1.0 M-3.0 GHz. The studies allowed determining the current conduction mechanism at the interface, the capacitive and inductive reactance, the resonance -antiresonance spectral positions, the inductive region width as well as the notch frequency of wave filtering. The resulting values and behaviors of the frequency dependent parameters indicated that the Yb/Ga_2S_3 heterojunction are promising interface for use as band stop filters and wave traps. These filters are also observed to be tunable through voltage biasing indicating the applicability of the devices as voltage linear oscillator.

Keywords: Interface; wavetrap; band stop filter; InSe

Light polarization effects on the optical properties of Se

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Abstract

Here in this work, the reflection/transmission of selenium thin film was studied using UV-VIS Spectroscopy. The spectral reflection and transmission were recorded at various wavelengths and variable angle of incidence. In addition, the polarization effects on optical reflectance and transmittance of Se film had been discussed as function of the angle of incidence in range of 30-80^{o}. Moreover, the absorption spectral analysis as function of polarization angle revealed an anisotropic behavior of the Se films. Particularly, the dependence of direct energy band gap on the polarization angle was explored and found to exhibit an increasing trend with increasing angle of polarization. The dynamics of the dielectric constant spectra as function of polarization angle also studied.

Temperature dependent conduction in In_2Se_3 polycrystalline films

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Abstract

The current conduction mechanism in In_2Se_3 thin films are explored by means of temperature dependent conductivity measurements in the temperature range of 50- 320 K. In the high temperature range (above 200 K), the current transport is found to be dominated by the thermionic emission of charge carriers over the grain boundaries through the polycrystalline films. The activation energy of electrons in this region is 65 meV. In the low temperature region, the current conduction is observed to be dominated by the variable range hopping of charged particles through the energy barriers. The hopping parameters presented by degree of disorder, density of localized states near the Fermi level, the average hopping range and energy are determined and was found to exhibit values of 1.98 $\times 10^5 K$, 8.5 $\times 10^{21} cm^{-3}/eV$, 11.95 A and 16.49 meV, respectively. The obtained values are promising as they indicate the applicability of the In_2Se_3 films as memory cells of low scattering and high hopping rates.

Keywords: In_2Se_3; hopping parameters; density of localized states

Mechanical properties of the CdSe/GaSe and CdSe/InSe bilayers

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Abstract

In this study we have grown a 100 nm thick InSe and GaSe onto polycrystalline CdSe thin films. The double layers are focused to X-ray diffraction beam of power of 1.2 kW. The X-ray diffraction patterns for the two types of the films are analyzed to fix the effect of the replacement of GaSe with InSe on the mechanical properties of the CdSe thin layer. The calculated lattice parameters, Miller indices, micro-strain, dislocation density, grain size and degree of orientation are observed to be highly influenced by this replacement. Namely, the micro-strain decreased from 0.0121 to 0.0077 and the grain size increased from 14.2 nm to 21.3 nm. Consistently, the defect density in the CdSe decreased from 2.39×10^{12} to 2.83×10^{11} line/cm^2, when the CdSe is covered by InSe instead of GaSe. These improvements in the mechanical properties are promising as they indicate lower energy barrier hight to the electron motion as a result of decreased strain and larger grain size.

Keywords: InSe; hopping parameters; density of localized states.

Photo-illumination effects on the current -voltage characteristics of Ga_2SeS photodiodes

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Abstract

The photoexcitation effects on the electrical properties of the Ag/Ga2SeS/Ag photodiodes were studied and analyzed. The photodiodes were excited by four different types of lasers of wavelengths of 406, 632.5, 850 and 1550 nm. The power of the laser light was also altered in the range of 0.5-6.0 mW. The photogenerated current was observed to increase with increasing biasing electric field and increasing power of radiation when the applied laser light energy was greater than the energy band gap of the crystal (2.4 eV). This case applied to laser light of 406 nm wavelength. On the other hand, when the laser light energy was less than the energy band gap, the photocurrent of the diode decreases with increasing biasing electric field. This behavior of the photodiode is ascribed to the interband transitions effects which force electron-hole generations to recombine through the energy levels in the band gap before reaching the conduction band. The dynamics of these photodiodes nominate it for use as an ultraviolet detectors.

Keywords: Photodiode; laser; ultraviolet; Ga_2SeS crystal

Optical properties of the ZnPC thin films

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Abstract

In this work, the ZnPc thin films which were prepared by the vacuum deposition technique is optically characterized by means of Uv-Vis spectrophotometery. For this purpose two films of different thickness are selected. The optical, transmission, reflection and absorption allowed determining the, the absorption bands, the energy band gap, the real and imaginary dielectric constants, the dielectric media quality factor and the optical conductivity of the films. It was observed that the more thick the film, the higher the absorption and the less the energy band gap. On the other hand, the dielectric dispersion analysis revealed that the dielectric spectra which is investigated in the frequency range of 300-1000 THz, shifted toward higher values when the thickness increased from 0.8 to 2.4 mm. In addition, three additional dielectric resonance peaks are observed at 764, 684 and 470 THz for the to 2.4 mm thick sample. Moreover, the oscillator and dispersion energies for both films are determined in accordance with the single oscillator model approach and observed to be slightly influenced by the increasing thickness.

Keywords: ZnPc; optics; dispersion; thickness effect

Temperature effects on the physical parameters of Yb/MgO/C MSM devices

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Abstract

The Yb/MgO/C metal-semiconductor-metal devices were studied by means of current- voltage characteristics in the temperature range of 300-450 K and impedance spectroscopy in the frequency range of 1.0 M-1.8 GHz. The analysis of the current-voltage characteristics have shown that the motion of the electrons in the device were subjected to a barrier height at two Schottky shoulders. The barrier height of the device increased steadily with increasing temperature showing the ability of the device to perform well even at 450 K. While current conduction mechanism was dominated by the electric field assisted thermionic emission of charged carriers causing tunneling through the barrier. The electron-hole recombination near the semiconductor -metal interface increased with temperature. In addition, the impedance spectral analysis of the device displayed a negative differential resistance and capacitance phenomena. The negative differential resistance and capacitance were important as they were employed for the cancellation of the parasitic capacitance in electron circuits that were used to amplify signals in monostable-bistable switching circuits used in mobiles.

Keywords: MgO; negative capacitance; temperature; MSM device

Au/InSe interface designed as resonators for optical communications

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Abstract

In the current work a 200 nm Gold is used as substrate to 200 nm thick InSe thin film. Both layers are prepared by the physical vapor deposition technique. The optical transmittance, reflectance, and absorbance of the glass/InSe the Au and the Au/InSe films are measured and analyzed in the incident light wavelength range of 300-1100 nm. From these optical spectra the effects of the Au layer on the energy band gap and on the dielectric spectra are determined. Particularly, it was observed that the energy band gap of the InSe films diminish from (1.50/2.76) to (1.00 /1.80) eV upon Au layer interfacing leading to a band offset of (0.50/0.96) eV. The real and imaginary parts of the dielectric constant of Au/InSe thin film exhibit resonance at 361 THz. The value corresponds to an energy of 1.50 eV which indicate that the dielectric resonance happens as a result of the direct allowed electronic transitions from the valence to the conduction bands that create the energy band gap of InSe. Such behavior are of interest as it indicate that the corresponding 834 nm wavelength become a standing wave traveling between the valence and conduction band edges. This wavelength value is very close to the 850 nm which is used for optical encoding of communication signals in fiber optics.

Keywords: InSe; dielectric resonance; fiber optics; interface

Quality Assessment of Oil from Olive Trees Irrigated by Waste Water Using Fluorescence Spectroscopy

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Abstract

This work focuses on the effect of irrigation of Palestinian olive oil on the emission and absorption wavelengths using the fluorescence spectroscopy technique. In addition, the effect of irrigation of olive oil on the physical properties: viscosity, refractive index, acidity, and mass density were measured.

The results indicate three bands, first band (360-430) nm for olive oil sample irrigated by rain water contains vitamin E and phenols more than other samples, the second band (450-590) nm for olive oil sample irrigated by reclaimed waste water contains oxidized products from vitamin E more than other samples, and the third band of olive oil samples irrigated by rain water contains chlorophylls more than others, the chlorophyll decreases when irrigation with waste water or reclaimed waste water. In addition the acidity increases for samples with trees irrigated by waste water which can be classified as Lampante oil. The experimental results of viscosity showed that the viscosity increased for all samples that were irrigated by waste water of crop 2014.

This study is the first time to be conducted in Palestine. It gives an indication about the quality assessment of oil from olive trees irrigated by waste water using fluorescence spectroscopy**.**

Electrochromic Properties of WO_3 doped with Ti and Zn atoms

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Abstract

WO_3 electrochromic thin films doped with Ti and/or co doped with Zn atoms have been prepared by sol-gel technique onto FTO/Glass substrates. WO_3 doped with 0.05% of Ti ($W_{0.95}Ti_{0.05}O_3$) was co doped with Zn molar concentration varies according to $W_{0.95}Ti_{0.05-x}Zn_x$, where x ranges from 0 - 5 %. For these films, different electrochromic parameters have been studied. Cyclic voltammetry (CA), Chronoamperometry (CA), and transparency during CA was used to study the electrochromic parameters. Best electrochromic properties was observed for co-doped film with nominal composition of $W_{0.95}Ti_{0.03}Zn_{0.02}$. Compared to all studied films, this film ($W_{0.95}Ti_{0.03}Zn_{0.02}$) showed the highest contrast ration ($T_b/T_c \approx 1.85$). Also, this film has highest coloration efficiency (60 cm^2/C), which is 2.2 times higher than WO_3 doped with Ti alone ($W_{0.95}Ti_{0.05}$). Moreover, co-doped film has a good switching time and excellent reversibility ($Q_a/Q_c \approx 0.95$), which are almost same as single doped film.

Synthesis and characterization of CdO nanoparticles *via* one port calcination of Dmphen-CdI_2 complex

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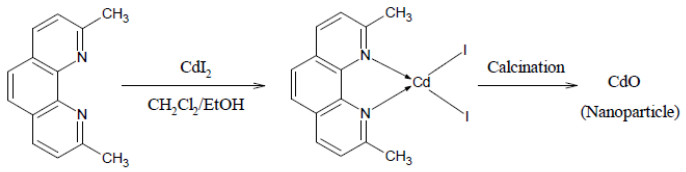
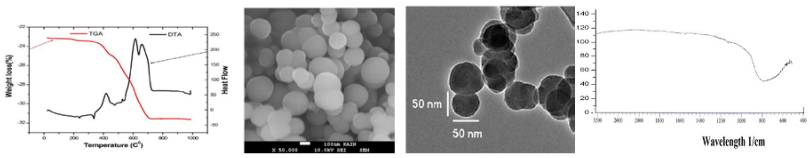
Abstract

Cadmium oxide (CdO) nanoparticles were prepared starting from organometallic *cis*-[dmphen-CdI2] complex (dmphen = 2,9-Dimethyl-1,10-phenanthroline) through one step calcination process at 800 ^{o}C, as seen in the scheme. The thermal behavior of the complex during calcination was recorded by TGA/DTA. The calcination steps reaction was monitored by FT-IR. The obtained product was analyzed by FT-IR, UV-visible, X-ray diffractometer (XRD), EDS, SEM and TEM; the average size of CdO nanoparticles was found to be 50 nm.





References

Synthesis and Characterization of CdO Nanoparticles Starting from Organometalic Dmphen-CdI2 complex A.S. Aldwayyan1, F.M. Al-Jekhedab, M. Al-Noaimi3, B. Hammouti, T. B. Hadda, M. Suleiman, I. Warad Int. J. Electrochem. Sci., 8 (2013) 10506-10514.

Synthesis of NiO nanoparticles *via* thermolysis of (phenanthroline)$NiCl_2$ complex

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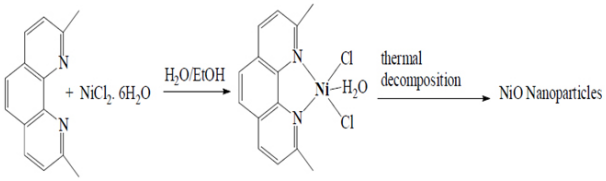
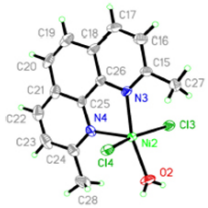
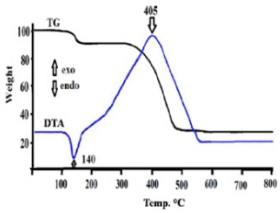
Abstract

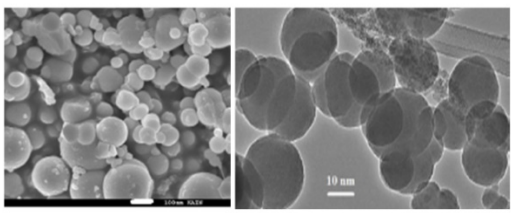
The synthesized (2,9-dimethyl-1,10-phenanthroline)$NiCl_2$ complex (see the Scheme) was characterized by elemental analysis, IR spectroscopy, UV-vis spectroscopy and differential thermal/thermogravimetric analysis (TG/DTA). The 3D structure of the desired complex was solved by single crystal X-ray diffraction (XRD) as triclinic system, as seen in Figure below.





The desired complex, subjected to thermal decomposition at low temperature of 400 °C in an open atmosphere, revealed a novel and facile synthesis of pure NiO nanoparticles with uniform spherical particle; the structure of the NiO nanoparticles product was elucidated on the basis of Fourier transform infrared (FT-IR), UV-vis spectroscopy, TG/DTA, XRD, scanning electron microscopy (SEM), energy-dispersive X-ray spectrometry (EDXS) and transmission electron microscopy (TEM), as seen in Figure below.





Modification of CuSe thin film electrodes prepared by electrodeposition: enhancement of photoelectrochemical characteristics by controlling cooling rate and covering with polymer/metalloporphyrin

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Abstract

CuSe thin films were prepared on FTO/glass using electrodeposition technique for the purpose of photoelectrochemical (PEC) conversion of light into electricity. Effects of annealing temperature, cooling rate, deposition time, annealing time, and coating with MnP-PE matrix on the film characteristics were investigated for different films using different techniques: AFM, PL spectra, UV-Visible spectra, together with PEC parameters including: dark J-V plots, photo J-V plots, value of short-circuit current, open circuit potential and stability. Coating the pre-annealed CuSe thin films significantly enhanced their physical properties and PEC characteristics. Moreover, pre-annealing the coated CuSe films with MnP-PE matrix for 2 hrs gave highest conversion efficiency and fill factor (14.3%, 77.4% respectively). This study has come out with a major finding and recommendation that is: Pre-annealing CuSe film electrodes at certain temperature (150^{o}C) for 2 hrs followed by coating with suitable electroactive matrix MnP/PE significantly enhanced their physical properties and PEC characteristics.

Keywords: CuSe, thin film, electrodeposition, annealing, cooling rate, PEC, efficiency, stability

The heat capacity of GaAs semiconductor quantum dot presented in magnetic fields

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Abstract

The heat capacity of two interacting electrons confined in a parabolic quantum dot presented in a magnetic field had been calculated by solving the Hamiltonian using exact diagonalization method. We had investigated the dependence of the heat capacity on temperature, magnetic field and confining frequency. The singlet triplet transitions in the ground state of the quantum dot spectra and the corresponding jumps in the heat capacity curves had been shown. The comparisons show that our results are in very good agreement with reported works.

Key words: Heat capacity; Exact diagonalization; Magnetic Field ; Quantum Dot.

Size selective synthesis of Aluminum oxide nanoparticles and their anti-bacterial activities

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Abstract

Metal oxide nanoparticles (NPs) are known to possess strong antimicrobial properties. Aluminum oxide NPs have wide rang application in industrial as well as personal care product. In our work tetraoctylammonium bromide (TOAB) stabilized and TOAB non-stabilized Aluminum oxide NPs in size range from 2 to 5 nm were selectively prepared by salt reduction method, the advantages of this approach is that it's cheap and simple preparation technique. Moreover, the size can be controlled easily by changing temperature, pH, concentration of the starting material and the use of the stabilizer TOAB. The sizes of the prepared was determined using X-ray diffraction (XRD) and the morphology of Aluminum oxide NPs was investigated by scanning electron microscopy (SEM)
The antibacterial activities of aluminum oxide NPs is expected to be particle size dependent, and will be compared to micro-sized aluminum oxide particles. Wastewater Disinfection by Synthesized aluminum oxide NPs will be investigated.

Synthesis, DFT and thermal analysis of (Z)-1-((5-bromothiophen-2-yl)methylene)-2-(2,4-dinitrophenyl)hydrazine Schiff base

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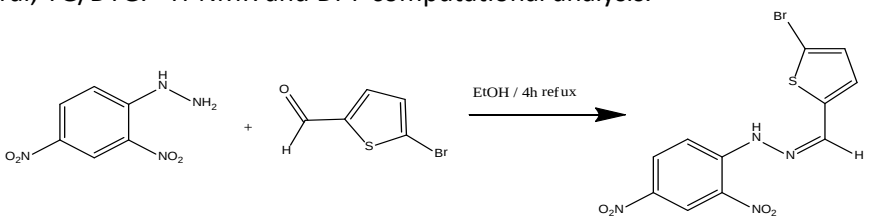
Abstract

New Schiff base (Z)-1-((5-bromothiophen-2-yl)methylene)-2-(2,4-dinitrophenyl)hydrazine was made available through condensing of (2,4-dinitrophenyl)hydrazine with 5-bromothiophene-2-carbaldehyde in good yield and fast technique, as seen in Scheme 1. Based on the theoretical calculation and experimental physical measurements Z- isomer is favored over E- isomer due to the intera H-bond between N-H…S, to form more stable six-membered ring.

The desired product formation was monitored by FT-IR and UV-visible, the structure was suggested based on: elemental analysis, EI-Ms, UV-visible, FT-IR spectral, TG/DTG. ^{1}H-NMR and DFT-computational analysis.



Scheme 1. Synthesis of the (Z)-1-((5-bromothiophen-2-yl)methylene)-2-(2,4-dinitrophenyl)hydrazine.

References

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Synthesis, DFT and antibacterial studies of new Schiff base derived from nicotinohydrazide

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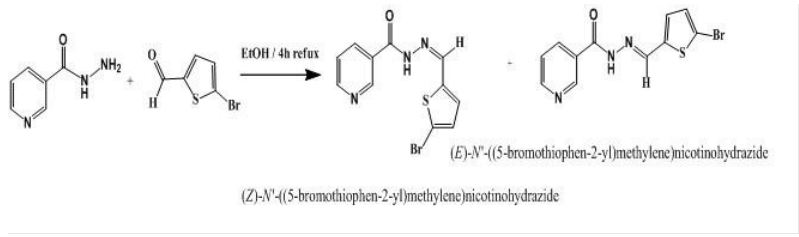
Abstract

A new Schiff base N'-((5-bromothiophen-2-yl) methylene) nicotinohydrazide was isolated and characterized as Z- isomer as seen in the Scheme.



The synthetic condensation reaction was monitored by FT-IR and UV-visible as well as DFT calculation. The structure of desired compound was experimentally analyzed based on: elemental analysis, EI-Ms, UV-visible, FT-IR spectral, TG/DTG. ^{1}H-NMR and DFT-computational calculation supported Z-isomer as favorited product over E one. Good agreement between experimental and theoretical calculatation were obtained. The antibacterial results obtained using the desired compound indicates a promising result against human pathogenic bacteria.

Keywords: FT-IR, condensation, TG, Schiff bases, DFT.

Analysis of Palestinian Olive Oil of Different Storage Ages by Fluorescence Spectroscopy Technique

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Abstract

This work focuses on the effect of storage age of Palestinian olive oil on the emission and absorption wavelengths using the fluorescence spectroscopy technique. In addition, the effect of storage age of olive oil on the physical properties: viscosity, refractive index, acidity, and mass density are investigated.

The olive oil sample which has different storage ages (3, 5, 16 and 17 years) has maximum emitted wavelengths ranged from 348.0 nm – 349.0 nm, 441.5 nm – 465.5 nm and 647.5 nm – 677.5 nm.

The emission bands ranged from 328.5 nm – 357.0 nm, 357.0 nm – 633.0 nm and 633.0 nm – 754.5 nm.

The viscosity for the sample of 3 years storage age at 25^{o}C is 58.1 cP. The value of the refractive index, the acidity (FFA%) and the mass density are 1.4671, 2.32 and 0.90948 gm/cm^{3}.

Some of vitamin E components (α-, β-, δ- and γ-tocopherol), and some of phenolic compounds (gallic acid, p-coumaric acid, o-coumaric, cinnamic acid, tyrosol and caffeic acid) in stored olive oil for more than 3 years showed an increase as the storage age increases. Some of vitamin E components (α-, β-, δ- and γ-tocotrienol), and some of phenolic compounds (vanillic acid and syringic acid) and chlorophyll a and b, pheophytin a and b in stored olive oil for more than 3 years showed a decrease as the storage age increases.

The viscosity, refractive index and mass density of olive oil samples at different storage ages decreases as the storage age increases, whereas the acidity increases as the storage age increases. The measured viscosity, refractive index, acidity and mass density of olive oil samples of storage age more than 5 years do not agree with the standard values.

The recommended olive oil of storage age less than 5 years is considered as an edible olive oil.

Determination of the Variation of the Trapped Charge in Organic Thin Film Transistors during Hysteresis

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Abstract

We compare different procedures to extract information about the trapping processes that occur in organic thin film transistors (*OTFTs*) during hysteresis mechanisms. The procedures are based on models that describe the transistor as the combination of an intrinsic transistor and the contact regions. The models are used to fit experimental output characteristics and to extract the current-voltage curves for the intrinsic transistor. We show the importance of eliminating the effect of the contacts, not only from fundamental parameters such as the mobility and the threshold voltage or the drain–terminal voltage, but also from the gate–terminal voltage. Using a previously developed compact model for the *OTFT*, this study aims to complement experimental procedures that also propose to eliminate contact effects. A study of the effects of the contact region on the value of the mobility extracted from different models has been made. Also, we have quantified the effect of eliminating the contact region from the gate- and drain-terminal voltages, and only from the drain-terminal voltage.

A proper extraction of the mobility with a model that incorporates contact effects is essential to obtain good results, even if the terminal voltages are considered instead the intrinsic ones. In this regard, a compact model that describes the output characteristics of the transistor and includes the effect of the contact regions is considered as the best scenario. The worst scenario is when the contact voltage is eliminated partially from the terminal voltages.

CdSe/FTO thin film electrodes prepared by chemical bath, electrochemical and combined elecrochemical/chemical bath depositions: A comparative assessment of PEC characteristics

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Abstract

CdSe thin films have been deposited onto fluorine doped tin oxide (FTO/glass) substrates by three different techniques, electrochemical deposition (ECD), chemical bath deposition (CBD) and combined method based on electrochemical deposition (ECD) followed by chemical bath deposition (CBD). The films were comparatively characterized by a number of techniques including (photoluminescence spectra (PL), electronic absorption spectra, scanning electron microscopy (SEM) and X-ray diffraction (XRD)). Photo-electrochemical (PEC) characteristics of the electrodes including photo-current density-voltage (J-V) plots, conversion efficiency (η) and fill factor (FF) were then studies. The PEC measurements indicate that all the CdSe films have n-type, and optical absorption measurements show that the prepared films have emission band with almost similar wavelength range (600-540 nm, 2.06 - 2.29 eV), while ECD shows some blue shift (580-520 nm) with higher band gap values (2.06 - 2.29 eV) to (2.13-2.38) eV.

XRD results show that the three systems involved nano-sized CdSe particles with cubic type crystals. The new ECD/CBD-CdSe electrode exhibited higher photo-electrochemical conversion efficiency (η%~ 4.40) than either ECD- or CBD-CdSe film electrodes.

Radiation Leakage in Some Healthcare Centers in Palestine

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Abstract

The values of power flux density in some healthcare centers in Palestine have been measured. The average values of measured power flux density were 2000µW, 402µW, 1262µW and 28µW in Arab Specialist hospital, Patient friend's society, Salfeet hospital and Rafediya hospital, respectively.
The magnitude of electric field, magnetic field and the specific absorption rate (SAR) were calculated from the measured power flux density, which were less than the standard levels limitation of exposure to EMR.
The dose rate for X and Gamma rays, beta radiation flux density inside the control room and waiting room in the X-ray rooms have been measured and their values were less than the maximum permissible dose for workers recommended by the Palestinian Ministry of Health in all tested rooms.
The effect of X-ray on radiologists, health in healthcare center has been studied. Blood oxygen saturation (SPO_2%), heart pulse rate (HPR), systolic blood pressure (SBP) and diastolic blood pressure (DBP) of the selected radiologists were measured before and after their shift, a significant impact does not appear in measured health parameter after exposure to EMR in radiology departments.

Water Soluble [Cu(dien)(NN)]Br_2 complexes and their antibacterial activity

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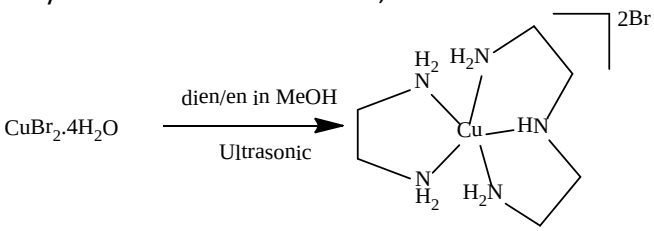
Abstract

Water soluble dicationic copper(II) complexes of general formula [Cu(dien)(NN)]Br_2 [dien = diethelenetriamineand NN is diamines] were made available in good yield under ultrasonic mode, as in the Scheme.



The reaction was monitored by both FT-IR and UV-vis spectroscopy. The 3D structure was solved by X-ray single crystal diffraction. The solvatochromism phenomena of such complexes is recorded in several types of solvents. These complexes were spectrally and thermally characterized. The complexes showed higher antibacterial activity against several types of bacteria depending on their structures geometry.

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Aqua bromo-*bis*-(propane-1,3-diamine)copper(II) bromide nanocrystal complex

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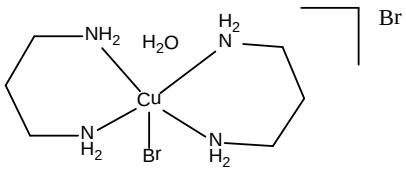
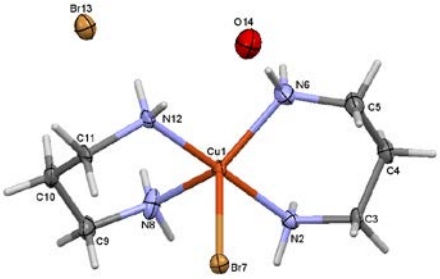
Abstract

Nanocrystal Cu(II) complex was prepared as in the scheme, characterized by spectroscopic techniques (IR, TOF-MS, UV-Visible, TG/DTA) and finally its three dimensional structure was confirmed by X-ray diffraction studies. The Cu^{II} ion is five coordinated by four nitrogen atoms of the base ligand and one bromide ion. In the crystal structure, molecules are connected through intermolecular hydrogen bonds of the type N---H...Br and N---H…O.





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[1] M. Al-Noaimi, M. I. Choudhar, F. F. Awwadi, W. H. Talib,T. Ben Hadda, S. Yousuf, A. Sawafta, I. Warad, Spectrochim. Acta, Part A, 127 (2014) 225–230. [2] T. Rosu, E. Pahontu, C. Maxim, R. Georgescu, N. Stanica, A. Gulea, Polyhedron 30 (2011) 154-162.

Effect of polyamines on low methoxyl pectin-based films

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Abstract

Low methoxyl pectin (LMPEC) contains a high amount of free carboxylic acid groups able to interact withCa^{2+}originating a gel network. LMPEC gelation primarily involves electrostatic forces between the cation and the negative charged cavity formed by the polymer chains where $Ca^{2+}$are inserted. These structures, called*egg-boxes*, are stabilized by both Van der Waals interactions and hydrogen bonds. They are of great importance both in the area of fruit and vegetable processing as well as for the use of LMPEC in various food products. Polyamines (PAs) are low mol.wt organic cations known to mimic the action of divalent cations both *in vitro* and *in vivo*. The different length of PA aliphatic chains, thus, stimulated us to investigate their effect on the mechanical and barrier properties of LMPEC-based edible films. In fact, LMPEC represents also a suitable polymeric matrix for the preparation of coating films potentially useful for food active packaging for its biodegradability and biocompatibility. One of the main additives of the bio-based edible films is the plasticizer, generally a small molecule of low volatility, like glycerol or sorbitol, able toimprove film extensibility and flexibilityby increasing both free volume and polymer chain mobility. Therefore, our research focused on the specific comparison among calcium, and the two PAs putrescine (PT) and spermidine (SPD) as possible agents influencing the functionality of LMPEC-based films prepared in the presence or absence of glycerol. Zeta potential and particle size were determined on LMPEC aqueous solutions as a function of pH and the effect of calcium ions, PT and SPD on LMPEC-based films were studied. Ca^{2+} and PAs were found to differently influence thickness, as well as mechanical and barrier properties, of films prepared at pH 7.5 either in the presence or absence of the plasticizer glycerol. In particular, Ca^{2+} was found to increase film tensile strength and elongation to break only in the presence of glycerol and did not affect film thickness and permeability to both water vapor and CO_2. Conversely, increasing PA concentrations progressively reduced film tensile strength and markedly enhanced film thickness, elongation to break and permeability to water vapor and CO_2, both in the presence and absence of glycerol. Our findings suggest that PAs give rise to a LMPEC structural organization different from that determined by calcium ions, previously described as "*egg box*" model, and that PAs can be used as effective plasticizers to obtain more flexible and less brittle hydrocolloidal films.

Purification of Groundwater from Heavy Toxic Metals using Suspended Polydentate Supported Ligands

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Abstract

This study aims to prepare and develop several vehicles chelation polydentate supported ligands and then installed it using sol-gel or polymerization or to be susceptible to imply conjunction with the highly toxic heavy metal ions in the water and disrupted the underground water used for drinking or agriculture, as the process of interaction between ligands and heavy metals depends on the circumstances surrounding conditions which are treated in this research. Metal ion uptake through complexation or hydrogels can be affected by hydrophilic-hydrophobic balance, the nature of chelate ligands and the extent of cross-linking of macromolecular supports. Ligand function also dictates reactivity, complexation ability and efficiency of polymer supported ligands in the present case expected to be good solution for such problem.

This research involves the synthesis and characterization of new polysiloxane surfaces modified with ortho-, meta-, or para-nitrophenyl moieties. The resulting adsorbents have been characterized by SEM, IR, UV, ^{13}C solid state NMR, BET surface area, B.J.H. pore sizes and TGA. These porous materials showed a very good thermal and chemical stability and hence they can be used as perfect adsorbents to uptake Cd(II), Pb(II) and Ni(II) from groundwater taking from Burqin town in Palestine. In order to investigate the adsorption efficiency for each adsorption process. The effect of solution conditions on each adsorption process were studied. These conditions involve the effect of contact time, pH value, temperature, adsorbent dose and the initial concentration of adsorbate. The maximum extent of adsorption was for (Si-p-NO_2) polymer in the presence of lead ions. This adsorption process needed only 1 minute of shaking to have 99.95% as percent of Pb(II) removal at solution conditions of 20°C temperature, pH value equals 8, 5 mg adsorbent dose, 50 ppm of Pb(II) solution as initial concentration and 7 mL solution volume.

The best equilibrium isotherm model for each adsorption process was investigated using Langmuir and Freundlich isotherm adsorption models. The kinetics of adsorption were also investigated using pseudo first-order, pseudo second-order and intra-particle diffusion kinetic models. In addition, Van't Hoff plot for each adsorption was investigated in order to determine the values of enthalpy change and entropy change.

New Routes for Synthesis of Environmentally Friendly Superabsorbent Polymers

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Abstract

New Sucrose – based monomers were prepared. The prepared monomers are Allyl Sucrose (AS) and Epoxy Ally Sucrose (EAS). Allyl sucrose was prepared by reacting sugar with allyl chloride in an alkaline medium. Allyl sucrose was then converted into epoxy allyl sucrose by epoxidation with m-chloroperoxybenzoic acid (m-CPBA). The prepared sucrose-based monomers were characterized by ^{1}H and ^{13}C NMR spectroscopy. Both sucrose-based monomers were then used as cross-linking agents to prepare an entirely new class of special biodegradable superabsorbent polymers. In addition, other cross-linking agent were also used including 1,4-butanediol diglycidyl ether (1,4-BDGE), and ethylene glycol diacrylate (EGDA). Ethylene glycol diacrylate was chosen because it is a well known cross-linking agent that is reported in the literature as a cross-linking agent for superabsorbent polymers. 1,4-Butanediol diglycidyl ether was used for the first time as cross-linking agent for superabsorbent polymer. The absorbency for the prepared SAP's were evaluated. Free swell for the prepared polymers was measured using the tea bag test, and the absorbency under load was measured using the hanging cell test method. Results showed that the free swells and absorbency under load decrease by increasing percentage of cross-linking agent, lowest absorbency observed at cross-linking about 4%. SAP cross-linked with EAS has the highest absorbent capacity and absorbency under load. This could be because it has the highest polarity and highest number of hydroxyl groups.

The advantages of the prepared polymers over the commercial one are that: first; they are biodegradable as shown by the biodegradability test; second, they are prepared in one step process. Since the commercial SAP is prepared in a two-step process, in the first step the acrylic acid is polymerized with the cross-linking agent then the produced SAP is surface cross-linked to enhance it absorbency under load.

Pure Palladium nanoparticles through themolysis of $PdCl_2$(Pan) complex under microwave Mode

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Abstract

$PdCl_2$(Pan) complex was served as precursor to prepare uniform and stable Palladium nanoparticles using oleic acid as solvent and reducing agent under time-depended microwave radiation (from 0-10 min). Reduction of PdX_2(Pan) by MW to Pd nanoparticles was monitored by UV-visible spectroscopy at four different maxima wavelengths as depicted in Figure 1.

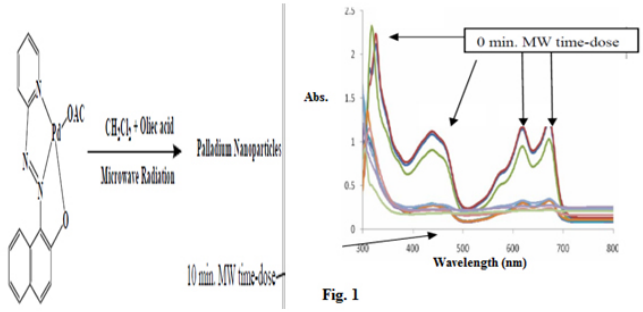

Fig. 1

The new Pd-nanoparticle material were characterized by several physical methods, such as UV–vis spectroscopy, IR, NMR, SEM, TEM, XRD analysis and PSA which confirmed the formation of nano-palladium material. Both the pure Palladium complex and Palladium NPS revealed high catalytic activity when subjected to Heck C-C cross coupling reaction under basic mild conditions [1-4].

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Development of Alpha Spectroscopy Method with Solid State Nuclear Track Detector Using Aluminum Thin Films

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Abstract

This work presents the development of alpha spectroscopy method with solid-state nuclear track detectors using aluminum thin films. The resolution of this method is high, and it is able to discriminate between alpha particles at different incident energies. It can measure the exact number of alpha particles at specific energy without needing the calibration of alpha track diameter versus alpha energy. This method was tested by using Cf-252 alpha standard source at energies 5.11 Mev, 3.86 MeV and 2.7 MeV, which were produced by the variation of detector -standard source distance. On front side, two sets of detectors (five each), were covered with two Aluminum thin films of different thicknesses and the third set of detectors were kept uncovered. The thickness of Aluminum thin films was selected carefully (using SRIM 2013) such that one of the films will block the lower energy alpha particles (3.86 MeV and 2.7 MeV) while the alpha particles at higher energy (5.11 MeV) can penetrate the film and reach the detector's surface. The second thin film will block alpha particles at the lowest energy 2.7 MeV and allow alpha particles at higher two energies (5.11 Mev and 3.86 MeV) to penetrate and produce tracks. For quality assurance and accuracy, the detectors were mounted on thick enough copper substrates to block exposure from the backside. For uncovered detector (third set), alpha particles at three different energies can produce tracks on it. The tracks on the first set of detectors are due to alpha particles at energy of 5.11 MeV. The difference between the tracks number on the first of detectors and the tracks number on the second set of detectors is due to alpha particles at energy of 3.8 MeV. Finally, by subtracting the tracks number on the second set of detectors from the tracks number on the third set of detectors (uncovered), we can find the tracks number due to alpha particles at energy 2.7 MeV. Thus, the discrimination between alpha particles at different incident energies is achieved. Therefore, knowing the efficiency calibration factor, one can exactly calculate the activity of the standard source.

Keywords: 1) CR-39 Detector 2) copper substrate 3) Aluminum 4) Alpha particles

Mixed diamine [Cu(NN)(NN)]Br_2 complexes and their potential against several types of bacteria

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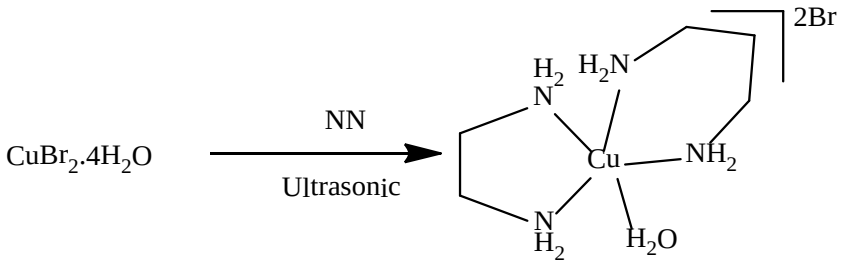
Abstract

Mixed-diamine ligands copper(II) complexes, [Cu(NN)(NN)]Br2 (1–2) have been synthesized. These complexes were characterized by spectroscopic and thermal techniques as seen in Scheme 1. Crystal structures for seveal type of such complexes showed a distorted trigonal–bipyramidal geometry around Cu(II) ion with one solvate water molecule [1]. Antimicrobial assays were conducted to evaluate the biological activities of these complexes.



The complexes showed higher antibacterial activity against several types of bacteria depending on their structures geometry.

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The optical band gaps and optical constants of non-crystalline WO_3 thin films doped with Ti deposited by dip coating in sol-gel

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Abstract

The optical constants and optical band gaps of the non-crystalline tungsten oxide (WO_3) thin films doped with Ti deposited by dip coating method onto glass substrates with different atomic concentrations of Ti have been investigated by optical characterization method. The amorphous crystal structure of the films when heated to 160 °C was revealed by XRD. The optical data of WO_3 thin film have revealed a direct allowed transition band gap of 3.1 eV, which increases slightly up to 3.6 eV by increasing Ti concentration due to the formation of TiO_2 new phase that may be introduced within the amorphous structure. The effect of Ti concentration on the film thickness and optical constants (refractive index, absorption coefficient and dielectric constants) of these films have been also investigated. The room temperature refractive index, which was calculated from the reflectance and transmittance data, allowed the identification of the dispersion and oscillator energies lattice dielectric constant and static dielectric constant of these films, which show that WO_3 thin films doped with Ti can be used as UV sensors, where 10% Ti doping is the best sensor.

Formulation of Microemulsion Based On Sugar Surfactant As An Alternative Fuel

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Abstract

In this study we innovated microemulsion formula that serve as water in diesel fuel using minimum amount of commercial and strongly hydrophilic sucrose monolaurate surfactant (1695) combined with medium chain alcohol. 1-pentanol has the best effect in enhancing w/o micremulsion region in the pseudo ternary phase diagrams. Moreover the phase behavior of sucrose monolaurate (1695), studied as a function of temperature and surfactant concentration, presented the form of the well-known 'fish' diagram. Anisotropy was detected using visual inspection, cross polarizers and polarizing microscope. Water volume fraction percolation thresholds were determined by studying the electrical conductivity. The average hydrodynamic diameter of microemulsion, measured using dynamic light, scattering equals 10.86 nm at 25°C.

Microwave thermolysis of oxime-copper(II) complex to rode nanometal oxides

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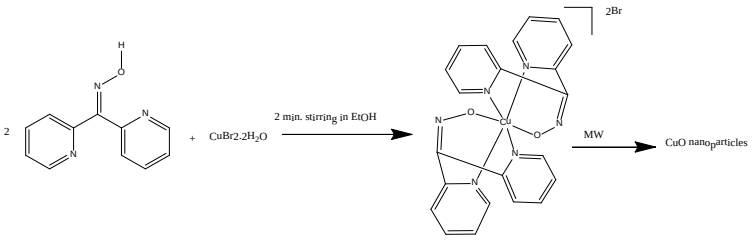
Abstract

Copper oxide nanoparticles belong to monoclinic structure system, it has different applications according to the chemical and physical properties such as superconductivity [8], photovoltaic properties, relative stability, low cost and the antimicrobial activity. There are several ways to synthesize the copper oxide nanoparticles in various sizes and shapes, and has entered into several major applications in our daily lives.

We here, in this work discuss microwave radiations of novel copper bromide/di-2-pyridyl ketone oxime complex as single precursors to prepare monoclinic CuO nanoparticles, as seen scheme 1, and their characterization by many techniques such as: XRD , SEM, EDX, UV-Vis. and FT-IR, as seen in Figure 1.



Scheme 1. Synthesis pathway of CuO nanoparticles from the desired complex.

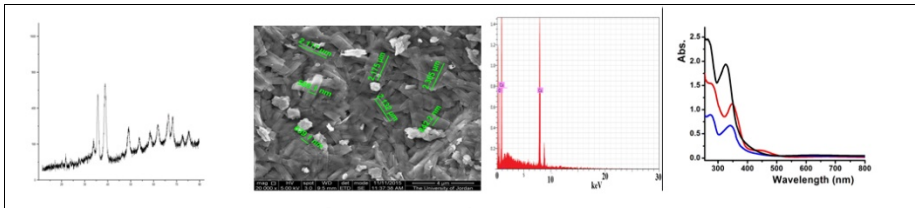


Fig. 1. XRD, SEM, EDX, UV-Vis of CuO nanoparticles.

Keywords: Cu(II) Complexes, XRD, MW, CuO nanoparticles.

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Synthesis, Characterization, Antibacterial Activities of Novel Polydentate Schiff's Bases-Metal Complexes

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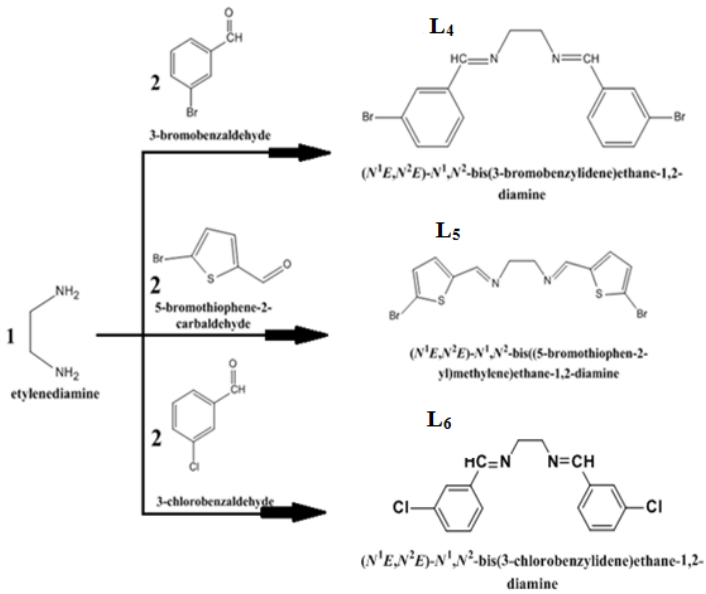
Abstract

Six new Schiffs' bases ligands were prepared by the condensation reaction of primary amines with aldehydes in absolute ethanol under reflux conditions.
The Schiff-base metal complexes were prepared by coordinating Copper Bromide and Cadmium Chloride with the corresponding ligand in solvent and inert system.



The ligands and their metal complexes were characterized by IR, UV-VIS spectroscopy, EA, ^{1}H-NMR ,^{13}C-NMR, TG/DTA.
The free ligands and their Cu(II) complexes revealed good anti-bacterial activities against several types of gram positive and gram negative bacteria.
Keywords: Cu(II) complexes, Schiff bases, chelate polydenatate ligands.

Biodegradable Poly (dl-lactide-co-glycolide) Microcapsules as a Drug Delivery System

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Abstract

Poly dl-lactide co-glycolide (PLG) is a biodegradable polymer that has a slow degradation rate and high permeability to small drug molecules.
PLG microcapsules were prepared by emulsifying a polymer solution that consists of PLG/solvent (dichloromethane) into a continuous phase that consists of a nonsolvent solution (water and SDS as a surfactant). After emulsification, the solvent diffuses out of polymer droplets (liquid microcapsules) to the nonsolvent solution and then evaporates at the surface of the nonsolvent to the air. The encapsulation of the limonene within the polymer microcapsules was prepared, and limonene release was determined with time from polymer microcapsules prepared.
The PLG microcapsules were prepared using different concentrations of SDS solution, methanol, and ethanol and study of its impact on the size of the PLG microcapsules.
Our results show that as the concentration of nonsolvent increases in the process of preparing of PLG microcapsules the size of prepared microcapsules decreases and the limonene release increases from polymer microcapsules with decreasing the size of microcapsules.
These results can be explained as follows: with increasing the concentration of methanol, ethanol or SDS, the viscosity of the nonsolvent increases and the interfacial tension decreases. This lead to a decrease in size of obtained PLG microcapsules and smaller microcapsules are obtained.

Hydrogen Storage on 3.5nm Core/Shell Mg/Pd Clusters Synthesized by Combined Salt Reduction-Electrochemical Technique

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Abstract

Hydrogen energy is an ideal renewable energy for as-present and future energy sources because of its energy is highly efficient with no harmful emissions compared with fossil fuels. However, it still needs many technologies to implement, like suitable storage system. There are mainly three ways for hydrogen storage, as a high pressured gas, high cryogenic liquid, or in solid materials. Both of the high pressure and liquid phase hydrogen storage systems were considered inconvenient routs because of efficiency, safety, and economic problems, in addition to the large energy consumption in liquidation hydrogen gas and in low temperature keeping. Currently, the solid materials for hydrogen storage well on way to explore or create the most suitable material for this purpose.

Either Magnesium and palladium metals have a remarkable hydrogen uptake capacity under proper conditions. Palladium uptakes hydrogen more like the sponge when absorbing water molecules and Magnesium is considered the most promising metal for hydrogen storage material in terms of 7.6% (wt%) of hydrogen that can be up taken. Unfortunately, several drawbacks were emerged on the scene when they have been applied. Palladium is a heavy metal and magnesium has problems in hydrogen diffusion and releasing processes makes them not suite to be used as hydrogen storage materials.

The combining of the both metals (Mg & Pd) have explored a promising properties and could be the solution for their H-storage drawbacks, through catalyzing the hydrogen adsorption/desorption process for magnesium and reducing the weight by lowering the amounts of Pd in the solid matrix.

In this project, nanoparticles of Mg and Pd metals with special morphological structure, known as core/shell, was synthesized using combined salt reduction – electrochemical technique, and the hydrogen storage capacity were investigated by studying the absorption and desorption behavior of both Pressure-concentration-temperature isotherm (PCT) and kinetics kind of view using Gravimetric analysis of high-vacuum electronic microbalance.