Role of nanotechnology in developing high tech from lab to consumer

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Nanotechnology holds massive potential to transform many sectors including healthcare, energy, electronics, and education and training. In healthcare, nanotechnology may create new ways and high-tech devices for early detection and diagnosis of disease, and precise and targeted on-demand drug delivery. In energy and lighting, nanotechnology may enable novel procedures and devices for harvesting and storing renewable photovoltaic solar energy. Realizing this future requires the collaborative efforts of all stakeholders to overcome the challenges of driving the technology throughout the development cycle, from lab to consumer. In this talk, we present the basics of nanotechnology and the characteristics of silicon nanotechnology, as well as explore the challenges inherent in commercializing radical nanotechnology innovations and making their benefits available to the public. Challenges of cost, mass production and safety are particularly relevant to applications in the healthcare and medical fields. We will also provide insights into how collaboration can help address these challenges and accelerate the pace of nanotechnology commercialization.

Agricultural and Biomedical Applications of Bionanotechnology to Tackle Grand Societal Challenges

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According to UN estimates 60% more food will be required by 2050 to feed 9 billion inhabitants of this planet, with many of the ingredients for the world's diet making transnational border crossings. Currently, the agricultural sector is confronting various global challenges such as: climate change, urbanization, sustainable use of resources, and environmental issues like run-off and accumulation of pesticides and fertilizers. Bionanotechnology offers novel methodologies and solutions to a wide range of overarching challenges facing agriculture, food, and biomedical systems. This involves seeding of innovative ideas and conducting fundamental and application-oriented research and development, for agriculture and food security through improved productivity, quality, and biodiversity; improved nutritional value of feeds and effective biomedical theranostics. The direction includes understanding the mechanisms of host-parasite interactions at the molecular level, development of new-generation of pesticides and their carriers, preservation and packaging of food and food additives. The talk will specifically discuss recent research efforts toward environment-friendly agriculture through the development of liposomes as a novel carrier for designing slow release formulations of commercially

available nematicides, sensing of nitrates in the soil, and the use of plant extracts for cancer nanomedicine tapping biophotonic crystal sensors and lab-on-a-chip technologies.

Keywords: Cellular biology, Drug Discovery, Medicinal Plants, Micro and Nanotechnology, Pesticides

Nanotheranostics for personalized cancer care

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Nanotechnology heralds an exciting new era of research and medical applications where science fiction may become a reality. In the true spirit of interdisciplinary quest and development of scientific knowledge, the fields of physical sciences and chemistry have now advanced nanotechnology to extend solutions and application in biology and medicine. The advances in nanotechnology thus far resulted in novel opportunities for discovery of clinically relevant markers, molecular disease imaging and tools for therapeutic intervention, which have a potential to transform the field of medicine. Studies are mainly focused in individualized treatments to garner greater benefit while avoiding treatment induced side effect. Nanotechnology offers a great opportunity in precession medicine whereby cancer could be diagnosed and treated simultaneously by a single agent, while its response to treatment monitored for accurate prognosis. Although nanotechnology is still in the research stage, several applications are maturing for translation from the bench to the bedside. In this session, after briefly describing currently available components in current nano-toolbox, that are expected to be incorporated in clinical practice in the conceivable future, we will review applications in cancer diagnosis and treatments ranging immune-modulation up to cancer therapeutics.

CNFM: National French Network in Micro and Nanotechnology Prospect of Cooperation with Palestinian Academic Institutes

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Micro and nano Technology high education in France is organized through a network composed of twelve centers, six of them having cleanroom facilities. During the last decade, there has been a strong evolution from microelectronics to nanotechnology in order to cope with the increasing demand of qualified human resources in the nanotechnology area.
This long experience in the field in nanotechnology may be useful for emerging countries willing to develop education and research in this field through a connection to this network whereby collaboration and know-how transfer can be implemented.

Keywords: high education and scientific research, national education network, nantechnology

Monitoring the effects of phase transitions on the structural and optical properties of Se/Ag/Se nanostructures

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In this work, two selenium layers of thicknesses of 500 nm which are nanosandwiched with Ag nanosheets of thicknesses of 100 nm (Se/Ag/Se) are subjected to an in situ monitoring of the structural and optical transitions during the heating process in the temperature range 303-473 K by the X-ray diffraction and ultraviolet-visible light spectrophotometry techniques, respectively. The Se/Ag/Se thin films are observed to exhibit phase transformation from amorphous to polycrystalline phases at 343 K. Raising the temperature above 363 K, enhanced the crystallinity of the hexagonal phase, decreased the microstrain, increased the crystallite size and reduced the defects density. Consistently, the optical absorption spectra redshift upon heating. The redshift is accompanied with transition in the value of the energy band gap from 2.03 eV to 1.85 eV as the material change structural phase from amorphous to polycrystalline. Increasing the temperature shrunk the energy bands gap. Another permanent phase transformation from hexagonal to orthorhombic is detected when the Se/Ag/Se system is allowed to cool. The scanning electron microscopy images has shown that the phase transformation converts the grains of Se/Ag/Se films from wire shaped to nano-tubes. The second phase transformation blue shifts the absorption coefficient spectra and increased the energy band gap. The enhancements in the structural and optical parameters that are achieved via heating process make the Se thin films more appropriate for optoelectronic applications.

Keywords: Selenium; thermal assisted crystallization; hexagonal; optical properties

Nanotechnology in Microbiology

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Every aspect of life is touched or could be touched by nanotechnology. Microbiology is a growing and expanding field of knowledge and applications. It greatly benefited from the advancement of nanoscience. Treating infectious diseases with nano-metal oxides alone or in combination with antibiotics is increasingly becoming a reality. Drug delivery systems dependent on nanomaterials in medicine is thought to enhance the effectiveness of treatment and reduce side effects. antimicrobial surfaces in hospitals, in food production facilities, swimming pools, farms, offices, and even mobile phones. The hard to prevent and to remove microbial biofilms are also treated with nano-materials with great success. This would revolutionize medical views on infectious diseases, industrial as well as environmental systems. Due to unique electrical, magnetic, luminescent, and catalytic properties of nanomaterials, faster, sensitive and more economical diagnostic assays can be

developed. Immuno-modulatory effects can also be obtained (e.g., Gold nanoparticles used as antigen carriers were shown to stimulate the phagocytic activity of macrophages and affect the functioning of lymphocytes). Nano fibers is also of great value in advancing microbiology. Wound dressing materials made from nano-fibers by preventing scaring and shedding of bacterial pathogens to the environment. In addition nano-fabrics are now used in making gowns and coats to avoid chemical and biological contamination of staff, patients as well as hospital visitors. In Gaza, this field needs support on the educational level (curricula development), research level (infrastructures and equipment) as well as promoting and encouraging students and academicians to specialize in the various field of nanosciences.

Photo-degradation of water-organic contaminants and bacteria with safe sensitized TiO_2 and ZnO nanoparticles: a green sustainable method for water purification

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Widely spread of chemically industry producing many types of environmentally pollutants (e.g dyes, herbicides, pesticides, insecticides, drugs, bacteria and others), most of these pollutants reach our drinking water resources, different strategies have been followed to purify contaminated water, one of the low-cost technology is using semiconductors as catalyst for photodegradation of water-organic contaminants. TiO_2 nano- and microparticles 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 bandgap semiconductors (e.g. CdS, with 2.3 eV) are used to sensitize TiO_2 particles. The TiO_2/CdS system has been used as a 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 & Curcumin) were used as a 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 that cause water contamination) 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 together.

Keywords: Photodegradation, Nanoparticles, TiO_2, ZnO, Sensitization, water purification**.**

Nanotechnology in Gaza: Reality and Prospective

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The manipulation of matter at the atomic and molecular scale to create materials with remarkably varied and new properties is a rapidly expanding area of research with huge potential applications in many sectors. Gaza- Palestine lives difficult conditions which make the possibilities of the research quite restricted. A team of distinguished researchers who come from different fields and backgrounds (physics, chemistry, biology and engineering) at the Palestinian universities in Gaza has established a Materials Science & Engineering Research Group (MERSG). MSERG is leading the best students of the undergraduate and graduate levels to lunch high technological projects in materials sciences serving the needs of the community and the Palestinian market.
Research interests focus on synthesis of novel functional materials and coatings to conduct innovative pre-competition research in the field renewable energy and environmental applications. Special emphasis is on dye sensitized solar cells, Perovskite solar cells, supercapacitors for energy storage antimicrobial coatings, photo catalyst for water treatment and recycling batteries.

Keywords: Nanotechnology, Gaza, research Group

Palestinian scientists and nanotechnology: Towards building sustainable economy in Palestine

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Palestine, yet to gain independence, faces many future challenges, most crucial is building a sustainable economy. Deprived from its natural resources, with its land being confiscated, Palestine can achieve goals only through establishing knowledge based economy, where know-how is the corner stone. Advanced materials (including nanotechnology) are possible basic foundations for future Palestine industrial revolution. The proposed approach to achieve this is to involve scientists from different domains in advanced materials research targeting areas of high priority (energy, environment, water, health, agriculture and

education). The next stage will be targeting other areas that sustain advanced industries (such as solid ionic conductors, solar energy materials, advanced batteries & superconductors, smart materials, high-tech, carbon nano-tubes, and other devices). To visualize feasibility of this strategy, we present here latest breakthroughs. This is to exemplify what Palestinian students can achieve in solar energy using nano-film electrodes of semiconductor materials. Comparison with other state-of-the-art studies in other prestigious laboratories is highlighted. Other examples of advanced material applications (advanced batteries, electrochromics, carbon nano-tubes and conjugated polymers) will then be proposed for researchers to target. Possible impact of Palestinian researchers in these areas, at global level, will then be critically discussed, with reference to areas of strength and limitations.

Charge Carrier-Plasmon Interactions at the (In, Pb, La)/Cu_2Se Interfaces

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In this work, we have studied the structural and optical performances of CuSe thin films which are grown onto thin transparent Indium, Lanthanum and Lead metal substrates. The metal/CuSe films which are prepared by thermal evaporation technique under vacuum pressure of 10-5 mbar displayed different characteristics based on the metal type. Particularly, while the In, Pb/CuSe displayed the same value of cubic lattice constant, the La/CuSe exhibited shorter lattice constants. The structural parameters, accordingly are also influenced by the substrate type. Namely, the grain size, the defect density, the staking faults and the stress exhibit higher values than those of In, Pb/CuSe interfaces. On the other hand, the optical spectroscopy studies which are carried out in the incident light wavelength range of 300-1100 nm revealed a less effect of the metals on the value of the energy band gap and remarkable effect on the high frequency dielectric constant. In addition, the Drude-Lorantz analysis and modeling on the imaginary part of the dielectric constant have shown that the scattering time at femtosecond level is increased in the presence of metal substrates. Such behavior indicates that the electronic friction in CuSe has decreased and the electronic transport become more effective. Consistently, the drift mobility is increased in the presence of metals. With the value of plasmon frequency being in the gigahertz range. The In, La, Pb/CuSe can be accepted as promising interfaces for use as plasmonic device and as microwave filters.

Keywords: Cu2Se, Plasmon, thin film

Formation and Characterization of (MoO_3/ZnS, InSe) Heterojunctions

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In this thesis we have explored the structural, optical, dielectric and electrical properties of the MoO3/(ZnS, InSe) interfaces by means of X-ray diffraction, UV visible light spectroscopy and current-voltage characteristics techniques. The MoO3/(ZnS,InSe) interfaces which are prepared by the thermal evaporation technique under vaccum pressure of 10-5 mbar are observed to exhibit amorphous nature of growth. Optically, while the MoO3/ZnS exhibit conduction and valance band offsets of 2.8 and 2.65 eV, respectively, the MoO3/InSe revealed energy band offsets of 2.15, 1.1 eV, respectively. The obtained ΔEc and ΔEv values nominate the interfaces for optoelectronic applications including thin film transistor technology. To verify the applicability of these systems in optoelectronic technology, the dielectric dispersion spectrum for the MoO3/ZnS are studied and modeled in Drude-Lorentz approach for optical conduction. The study indicate that the formation of this heterojunctions enhances the drift mobility of the charge carriers to 13.1 cm2/V.s and make the Plasmon frequency range narrower. On the other hand, the Drude-Lorentz modeling for MoO3/InSe interfaces have shown that the drift mobilities for this interface could be improved more and a value of 48.7 cm2/V.s is obtained. As indicated from the electrical measurments, the MoO3/ZnS system electrically fails to behave as thin film transistors. On the other hand, The MoO3/InSe heterojunction which was electrically investigated revealed characteristics of back to back schottky devices. The analysis of the current-voltage characteristics of this device has shown that the current is dominated by themal excitations accompanied with charge particle tunneling through barrier height of $\sim 0.7\ eV$. The device also displayed resonant tunneling diode characteristics during reverse biasing conditions. The MoO3/InSe device appear to be promising for optoelectronic applications.

Design and Optical Characterization of Indium Sandwiched Molybdenum Trioxide Thin Films

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In the current study, the structural, optical and dielectric properties of the MoO_3/In/MoO_3 nanosandwiched structures are investigated by means of X-ray diffraction and ultraviolet-visible light spectrophotometry techniques. While the thickness of MoO_3 is kept at 500 nm, the thickness of the Indium slab is selected in the range of 25-200 nm. The insertion of 200 nm indium layer as a nanosandwich has induced the crystallization in the amorphous MoO_3 films. Upon annealing, those sandwiched with 200 nm indium slab, displayed well crystalline phase of orthorhombic a-MoO_3 at annealing temperature of 250 ^{o}C. Optically, remarkable

enhancement in the absorption coefficient associated with redshift in the energy band gap is observed. In addition, the dielectric spectral studies are found to exhibit a significant increase in the dielectric constant value with increasing indium slab thickness. The Drude – Lorentz modeling of the imaginary part of the dielectric spectra has shown that the insertion of thin layer of indium could increase the number of free carriers available for optoelectronic conduction. It reveals a wide variety in the plasmon resonant frequency on the surface of the MoO_3/In/MoO_3 films associated with the scattering time of electrons at gigahertz frequencies. However, it is observed that the 200 nm Indium sandwiched films have very distinct optical and dielectic properties different from other films. These various properties are promising for using the MoO_3 in different applications and it indicate the applicability of these sandwiched in optoelectronics devices.

Keywords: MoO_3; dielectric; optical properties; orthorhombic; Plasmon.

Perovskite Materials and Spiro-MeOTAD in Perovskite Solar Cells

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Thin film perovskite materials have demonstrated exceptional potential for optoelectronic devices and are currently under intensive research efforts. Using photoemission spectroscopy (PES) and mercury drop electrode I-V measurement under controlled environmental conditions we unraveled the combined effects of different elements in ambient air that affect the performance of LiTFSI-doped spiro-MeOTAD hole transport material (HTM) [1-3]. We found that each of humidity, oxygen, and ambient air has different effects on the performance of the HTM. The observed effects are directly correlated with controllable morphological features that were discovered using atomic force microscopy and scanning electron microscopy. Furthermore, we engineered the interface between the HTM and the methylammonium lead iodide (MAPbI3) perovskite using ultrathin layers of dissociated methylammonium [4]. The perovskite surface modification resulted in an efficient interfacial energy level tuning, enhanced solar cell device performance and better reproducibility.

Magnetic and thermal properties of a semiconductor quantum dot with Rashba spin – orbit parameter and applied external fields.

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In this paper we investigate the effects of external tilted electric field, magnetic field, and Rashba spin – orbit coupling on the magnetic and thermal properties of donor impurity confined in parabolic gallium arsenide (GaAs) quantum dot (QD). Exact diagonalization method is used to solve the QD Hamiltonian and obtain the eigen -energies and the binding energy of the donor impurity as a function of various QD physical parameters: magnetic and electric fields, confining frequency, tilt angle, temperature and the Rashba interaction parameter which is a key parameter in the up growing field of spintronics. We have studied the variation of the average statistical energy of the QD by changing the electric field, magnetic field, and the RSO coupling parameter, hence their effect on the magnetization, magnetic susceptibility and heat capacity. Our results show that the aforementioned parameters can tune the magnetic properties of the GaAs quantum dot and flip the sign of magnetic susceptibility from negative (diamagnetic) to positive (paramagnetic) type material. Moreover, those parameters have significant effect on the heat capacity of the QD.

Heat assisted structural evolutions and related optical transitions in Yb nanosandwiched CuSe films

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In this work, we have explored the temperature dependent structural and optical properties of Cu_2Se thin films that are nanosandwiched with 50 nm thick ytterbium nanolayer (CYC) which are thermally evaporated in vacuum medial. The X-ray diffraction monitoring of the films during the heating process in the temperature range of 293- 473 K has shown that the CYC films which contain both of the cubic and orthorhombic phases in its structure exhibits lattice expansion that increases the grain size and decreases the defect density, stacking faults and microstrain by 12.5% and by 28.9%, 12.8% and 11.3%, respectively. The CYC films show enhanced permanent crystallinity presented by high degree of orientation with reduction of the weight of the orthorhombic phase after cooling. On the other hand, a red shift in the energy band gap value is observed during the heating process. The analysis of the temperature dependent optical properties has shown a good correlation between the lattice expansion and energy band gap narrowing. The enhanced crystallinity of Cu_2Se films by the heating process make them more suitable for thermoelectric and optoelectronic applications.

Keyword: Cu2Se; phase transformation; orthorhombic; thermal expansion; optical.

Nanoparticles *and their applications in health and modern* medicine (Nanomedicine)

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Nanoparticles are materials with overall dimensions in the nanoscale, i.e., under 100 nm. Nanoparticles have made major contributions to clinical medicine in the areas of medical imaging and drug/gene delivery. Indeed, there are some instances where nanoparticles enable analyses and therapies that simply cannot be performed otherwise. However, nanoparticles also bring with them unique environmental and societal challenges, particularly in regard to toxicity. While several innovations such as iron oxide contrast agents and many drug delivery systems are by now well-established, newer technologies continue to emerge following the same basic concepts of design. As these innovations advance to clinical application, attention must be paid to environmental and societal implications, particularly in areas such as quantum dots. This article aims to highlight the major contributions of nanoparticles to modern medicine especially medical imaging and also discuss environmental and societal aspects of their use.

Keywords: nanoparticles, contrast agents, drug delivery, tumors, quantum dots, toxicity

Silver nanoparticles : controlled synthesis and application

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In this research, we present controlled synthetic method to synthesis silver nanostructures having different shapes such as spherical, prism and hexagonal. The method is based on the reduction of silver ions by sodium borohydride and ascorbic acid using tween-20 and trisodium citrate as stabilizers. Ag-MgO nanostructure has been synthesized and its antibacterial activity has been investigated. Silver nanoparticles has been used as sensing probe for determination of critical micelle concentrations of anionic surfactants. Some analyts has been detected and determined by silver nanoparticles.

Enhancement of Reactive Red 198 dye photocatalytic degradation using physical mixtures of ZnO-graphene nanocomposite and TiO2 nanoparticles: an optimized study by response surface methodology

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The photo catalytic activity of ZnO-graphene (ZnO-G) nanocomposite and TiO2 nanoparticles physical mixtures for the enhanced degradation of reactive red dye 198 (RR198) under UVC light was evaluated and established. The photo catalytic results revealed that the RR198 was degraded at around 34.4% and 37.7% after 180 min of irradiation, respectively, in the presence of ZnO-G nanocomposite and TiO2 nanoparticles, solely. Interestingly, physical mixtures of both catalysts induced an enhanced catalytic activity comparing to the bare ones. The ideal mixing ratio was found to be 66:34 wt% (ZnO-G:TiO2) with 71.8% degradation performance after 180 min of irradiation. Moreover, the response surface methodology using the best mixture was employed to optimize and determine the interaction effects between three independent operational parameters which are photo catalyst dosage (0.4 – 0.025 mg), initial pH (3–11), and initial dye concentration (5 – 15 mg/L). Based on the results obtained, it was found that a maximum predicted degradation efficiency of RR 198 reached 99% was in agreement with the average of three experimental values (96%) under the following optimal conditions: 0.4 g mixture dose, initial pH of 3.8, and 5 mg/L initial dye concentration. This convergence between the predicted and experimental results indicates the validity of the model for predicting the maximum percentage degradation of RR198 under the above-mentioned optimum conditions. The ANOVA result indicated that the model is significant with the P value of 8.683 × 10–10 is less than 0.0001, which implies that the model terms are highly significant. Regression analysis with an R2 value of 0.986 indicated a satisfactory correlation between the experimental data and predicted values. Additionally, non-toxic metabolites with respect to Daphnia Magna and high total organic carbon reduction after treatment with the mixture evidenced that this process can significantly decrease toxicity and mineralize the dye. Finally, the universal degradation ability of the photo catalysts mixture was evaluated and proven towards many model substrates.

Keywords: ZnO-graphene; TiO2 ; Physical mixture; Photo catalytic degradation; Response surface methodology; Reactive red 198

Perovskite solar cells free of hole transport layer

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This work covers the fundamental science, synthesis, characterization, properties and applications of TiO_2 Nps. Herein, easy and simple structured perovskite solar cells (PSCs) are designed and characterized. Our effort was to reduce the cost of the fabrication of such PSC devices, first by using an inexpensive starting precursor (aqueous methylamine solution) for the perovskite materials and second by design in a PSC structure free of the expensive hole transport layer (HTL). The $CH_3NH_3PbI_3$ perovskite sols were deposited onto a conductive FTO glass using the spin coating technique followed by heating at 100 °C for 10 min. The structure of the films was characterized by X-ray diffraction (XRD) and their optical

properties by UV–VIS spectrophotometry and photoluminescence (PL). The obtained phase confirmed the formation of a tetragonal perovskite structure. Two different solvents have been used, dimethylformamide (DMF) and dimethyl sulfoxide (DMSO). The effect of the type and the concentration of the used solvent DMF and DMSO on the performance of the solar cells have been investigated. It was found that a 40% concentration of the perovskite material resulted in the optimum film thickness that gives the best photoelectric performance. The DMF-based PSC assembled solar cell exhibited the best performance with an open circuit voltage of 750 mV, a photocurrent density of 12.5 mA/cm^2, and an overall photon to electric conversion efficiency of 5.7%; all these results are higher than those of cells made with DMSO.

Manganese Oxides Thin Films for Supercapacitors Applications

J.Asad , W. Rajab , S..Shaat , N. Dahoudi , A. Kahlout

Mn_3O_4 Sol- gel electrodes have been made using 1.0 M methanolic solution of manganese acetate dihydrate ($Mn(CH_3COO)_2$ via spin coating technique on FTO followed by heat treatment at different temperatures: 200, 250 and 300 ^oC. The thermal properties of the xerogel were studied using thermogravity analysis (TGA) technique which revealed that no changes are expected at temperatures higher than 300 ^oC. The structural and morphological properties have been characterized by X-ray diffraction (XRD), Fourier transform infrared spectrum (FTIR) Scanning electron Microscope (SEM) and High resolution transmission electron microscope (HRTEM), which revealed that films have a Mn_3O_4 tetragonal Hausmannite structure with particle size ranges from 35-65nm.The obtained FTIR results confirmed the existence of the same phase coincided with the XRD results The optical properties have been studied using UV-VIS and Photo-luminescence (PL) spectroscopy. The obtained PL emission illustrated two broad bands.. The electrochemical performance of Mn_3O_4 electrodes annealed at different temperatures were examined by cyclic voltammetry (CV) in three electrode cell and 1 M Na_2SO_4 electrolyte solution at a scan rate of 100mV/s. The electrochemical properties are found to be influenced by the electrode annealing temperature. A decrease in specific capacitance was found for electrode heated at temperature greater than 250°C. The highest obtained value of specific capacitances 283 Fg^{-1}), which is achieved by heating the electrode at temperature of 250 ^oC. Higher specific capacitance values were obtained by decreasing scan rate to reach the highest value of 230 Fg^{-1} at scan rate of 10 mV/s. Sol-gel Mn_3O_4 film are a promising candidate to be used as an electrode material for supercapacitors.

Keywords: Supercapacitors, Mn3O4, Sol-gel, Heating temperature, Electrochemical performance, Cyclic voltammetry, Specific capacitance.

Simulation of solar cell structure models based on Nanoparticles

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Solar energy is considered rapidly to be through solar cells or photovoltaic energy conversion is the most alternative candidate for sustainable energy production meets the demand need of the world. Solar cells give the promise for a cost-effective, green, safe, renewable and clean energy converting the sunlight directly into electrical power. Metals nanoparticles (NPs) such as silver (Ag), gold (Au), aluminum (AL) are promising material candidates with useful interesting properties as localized surface Plasmons which are generated through the interaction of light with these nanoparticles. Nanoparticles (NPs) can easily increase the path length of light and then increasing the efficiency of the solar cells.
In this work, various multilayers waveguide structure containing Nanoparticles are proposed to enhance the absorption of solar light. The proposed waveguide structures are examined in terms of absorption and transmission of light for various physical properties of the structures. High efficiency has been achieved by optimizing the Nanoparticles layer by tuning the fraction of Nanoparticles on the host layer.
The proposed waveguide structures could be very excellent candidates for future solar energy technology.

Keywords: Thin-film solar cell, metal nanoparticles, FDTD, absorption, Reflection.

Antimicrobial & Anticancer Activities of synthesized Green Metal Nanoparticles Using Minerals waste Recycling By green method's

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In this paper, an extensive study was conducted on the recycling of mineral waste and its transformation into nanoparticles such as gold, silver, iron and lead without the use of any chemical additives. The effect of these nanoparticles on a number of difficult microbes that are resistant to antibiotics and The results were distinctive by demonstrating the strong effect of Green nanoparticles in killing these microbes with the least concentrations and as quickly as possible. The second part of the study was tested directly on the samples of nanoparticles on breast cancer cells and achieved distinctive results in reducing the impact of cancer cells by 70 percent.

Continuous flow photodegradation of olive *Zebar* contaminants with simulated solar light using supported ZnO nanoparticles

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Photocatalysis and adsorption are of the modern methods for water purification from biological and chemical pollutants. Photocatalysis is based on the presence of a catalyst (Zinc oxide) that absorbs ultraviolet radiation to destroy the contaminant substances (phenolic compounds). The continuous flow system is designed to allow Zebar water (contaminated with phenols) to run continuously over the catalytic surface while exposed to simulated solar light. There is an entrance connected to the glass container, on which the catalyst is installed. On the other hand, there is an outlet for the treated water to be collected in another container for the necessary tests. Zinc oxide, supported onto natural clay particles, was also installed on the glass. Zebar water was passed over the catalyst film under simulated solar light for photodegradation purposes. Effects of different parameters on photocatalytic process were studied including Zebar dilution, time duration, and pH. In the case of ZnO/glass catalyst, 40.8% of organic contaminants disappeared in 30 h, while in the case of ZnO/clay/glass 42.5% of organic contaminants disappeared. The supported catalyst was reused for several times. It showed no significant efficiency lowering after multiple uses.

Keywords: Photodegradation; Zebar; Water treatment, Olive waste

Construction and physical properties of engineered connective tissue Enriched with modified carbon nanotubes

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Chronic wounds and extensive burns are major health problems worldwide. The current pharmacological and surgical treatment options have many limitations, and normally take several weeks or months to achieve wound closure. The aim of the project was to generate engineered connective tissue that could function as a dermal tissue substitute. Engineered connective tissues (ECT) in the form of rings were generated composed of collagen, human foreskin fibroblasts (HFF) and different ratios of multiwall carbon nanotubes conjugated with either chitosan (C-MWCNT) or tetraethylyene glycol (T-MWCNT). The rings were subjected to rheological and microscopical investigations. The ECT formed successfully in the presence of the modified MWCNT. At the concentrations 0.025 and 0.05% of T-MWCNT there was an increase in the stiffness of the ECT as shown by the Young's module data. This was associated with an increase in the formation of stress fiber as shown by the

fluorescence imaging. In addition, there was a reduction in the breaking stress, yield point stress and yield point strain. On the other hand with 0.1% T-MWCNT the ECTs became stiffer as demonstrated by higher Young's module. Moreover, the 0.1% T-MWCNT increased the tensile strength and the ductility of the ECT as demonstrated by the higher magnitude of the maximum stress and breaking strain respectively. Similar results were observed for C-MWCNT, with the exception that could increase the breaking stress. In conclusion, MWCNT can improve the physical properties of the ECT.

Application of Nanotechnology in Cancer therapy: A Research Case in Palestine

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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 health annual report 2013 of the Palestinian Ministry of Health (MOH), cancer is considered the third leading cause of death in the Palestinian society after cardiovascular and cerebrovascular diseases (representing 11% of total deaths). It is important to note that tens of million dollars is spent annually on the treatment of cancer cases locally and abroad. However, the existing anticancer drugs have many withdraws such as the serious side effects and the raised resistance of the traditional chemotherapy. 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 increase the targeting efficacy, enhanced permeability and retention, improved the half lives and consequently decreases the side effects.

Controlling the Motion and Stopping of Ferrofluid Droplets Using Surface Tension Gradients and Uniform Magnetic Fields

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We will present our work on controlling the motion and stopping of individual water-based ferrofluid droplets due to a wedge-shaped surface tension gradient and a uniform magnetic field.i Uniform DC magnetic fields applied parallel to the surface tension gradient direction allow the droplets to spread freely in the direction of the gradient regardless of the strength of the field. However, weaker uniform magnetic fields are enough to pin a droplet and prevent it from spreading down the surface tension gradient direction when the magnetic field is applied perpendicular to the gradient. This combined effect can be thought of as a

'valve' that can be used to control the flow and stopping of individual ferrofluid droplets on horizontal surfaces…

Synthesis, characterization and optical properties of ZnO nanostructures: from nanoparticles to nanorods

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ZnO nanorods of controlled lengths were synthesized by chemical route method without surface modification. The morphology and structure of the nanorods were characterized by transmission electron microscopy, Raman spectroscopy and X-ray diffraction. It was observed that the ZnO nanorods are hexagonal-shaped with diameters in the range of 16-20 nm and length up to 150 nm based on growth time reaction. Photoluminescence (PL) and UV–visible absorption measurements have been performed at room temperature. The PL spectrum showed that the relative intensity of ultraviolet (UV) and (defects) green band depend on the length of ZnO nanorods. The peak of photoluminescence of UV band around 395 nm is strongly enhanced when the length of ZnO nanorods is reduced and the green emission decreases.

Keywords: ZnO nanoparticles**,** ZnO nanorods, Raman spectroscopy, UV–Vis spectroscopy, Photoluminescence spectroscopy

Theoretical and experimental analysis of energy in charging a capacitor by step-wise potential

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In this paper, charging capacitor in RC circuit, to a final voltage,V_0 via *N* steps, is investigated and analyzed both theoretically and experimentally. The obtained results show that the energy stored in the capacitor a constant independent of *N*, but the dissipated energy in the resistor and the consumed energy by the power supply decreases as number of steps *N* increases. The limit $N \to \infty$ is examined and our result shows that the dissipated energy vanishes theoretically. This limit is carried out experimentally by using a ramp potential.

Electrodeposited NiO Electrochromic Thin Films Prepared Using Low Deposition parameters

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In this work, Electrochromic and structural properties of NiO thin film prepared using optimized electrodeposition parameters were studied. The parameters optimized were deposition current density, molar concentration of nickel nitrate solution, and deposited charge density. The best electrochromic parameters was observed for film deposited using deposition parameters of -0.05 mA/cm^2 deposition current density, 0.02 M of $Ni(NO_3)_2.6H_2O$ solution, and charge density of 80 mC/cm^2. For this optimized film, the transmittance modulation ΔT was 76 %, the efficiency η was 19 cm^2/C, and charge reversibility Q_c/Q_a was 98%. XRD diagram for the optimized NiO thin film reveals the film's amorphous nature. In addition, SEM image confirmed the film amorphous structure in addition to it's high porosity.

Posters

Enhancement of Electrical Performance of MoO_3 Films via Indium Nano Sandwiching

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In this thesis the impact of the Indium nanolayers on the characteristics of MoO_3 thin films are explored. Indium metallic nano- layers of thicknesses of 50, 75, 100 and 200 nm are sandwiched between two 500 nm thick MoO_3 thin films.The X-ray diffraction techniqueis used to find out the structural properties of the MoO_3 and MoO_3/In/MoO_3 layers. In accordancewith this technique, MoO_3exhibit crystalline form called orthorhombic structureα-MoO_3 phase. The indium induced formation of crystalline phase when its thickness exceeds 50 nm.In addition, the impact of the indium thickness on the electricalperformance of the films was searched in a wide range of temperature.It was observed that the dielectrical conductivity is highly sensitive to temperature and indium thickness. Electrically almost no difference was observed between the hall bar and van der pauw type samples. Both conduct by thermionic emission revealing an activation energy that become deeper with increased indium thickness. Furthermore, the room temperature frequency dependentimpedance, conductance and capacitanceweremeasured in the frequency range of 10-1800 MHz. Remarkable shift in the frequency value of maximum conductance was observed upon indium layer enhancement. The theoretical analysis and computer simulations that targeted the exploration of the physics of resonance phenomena which is accompanied with by negative capacitance phenomena have shown that, the Au/MoO_3/C device is of tunneling diode type in which the current conduction covert from tunneling to correlated barrier hoping at 300 MHz. This type of study is expected to open the doors for efficiently utilize the MoO_3 films in optoelectronic technology with less resistance and best optoelectronic achievement.

The Electronic Structure and Heat Capacity of the Donor Impurity Confined in a GaAs Parabolic Quantum Dot

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The effects of magnetic and electric fields on the donor impurity states confined in a GaAs two dimensional (2D) parabolic quantum dot have been studied. The impurity energy and binding energy of the ground state and some low-lying excited states were calculated. The Hamiltonian was solved using shifted 1/N expansion method within the effective mass approximation. The results had been displayed as a function of physical parameters: confinement strength ω_0, magnetic field strength ω_c, and electric field strength F. Moreover, the dependence of the heat capacity C_v of the donor impurity on temperature T, confinement strength ω_0, magnetic field strength ω_c, and electric field strength F were investigated.

Recycling CdSe-Based Thin Film Solar Cells

Sohaib Abu Alrob, Hikmat Hilal, Ahed Zyoud

Solar cells considered as an important source for renewable energy, thin film Semiconductor electrodes are being assessed as alternative to conventional monocrystalline semiconductor electrodes. Due to many reasons, thin films demand less starting materials, lower processing cost and less pollution compared to monocrystalline semiconductor electrodes. Although, cadmium and selenium cause many harmful effects, such materials are still widely studied in solar cells and other applications. In this work, CdSe thin film based solar cells recycled into preparation new solar cells. The recyciled CdSe was prepared by electrochemical deposition (ED) technique, the chemical bath deposition technique (CBD), and combination of electrochemical deposition followed by chemical bath deposition (EC/CBD). The newly recycled CdSe solar cells have comparable efficiencies like freshly prepared ones. The recycling process will have environmental and economic value in the future by preventing contamination of the environment with these hazardous pollutants. The effect of annealing temperature and cooling rate was studied; the 150 ^{o}C was the best annealing temperature.

Combined effects of Rashba term and topological defect on thermal and magnetic properties of GaAs Quantum dot

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In this work, we study the dependence of the energy level spectra of a single electron quantum dot on the strength of the magnetic field and Rashba spin orbit interaction term in addition to the topological defect. Furthermore, the average statistical energy of the quantum dot system is calculated, as essential step, to investigate the effect of Rashba and topological parameters on the magnetic and thermal properties of the quantum dot system.

Optimisation Of Refractive Index Of Selenium By Fresnel's Equations And Swanepoel Technique

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Selenium film was deposited on a transparent glass substrate using physical vapour deposition (PVD) technique. The optical characterization of thin Se film was studied by two techniques, one of them, the analysis of transmission spectra measured at normal incidence in the spectral range (190-1100) nm. The envelope method, proposed by swanepoel is commonly used method for studying optical properties of films with uniform and non-uniform thickness. (the refractive index n , the dielectric constant εs , the thickness (d) are calculated and found to be 2.525 , 6.375 and 1.214μm respectively .the other technique is used is Fresnel's equations the refractive index n and the dielectric constant εs , are calculated and found to be 2.384 , 6.406 respectively

Keywords: film, optical transmittance, dielectric constant, Swanepoel's method, refractive index, thickness.

Optical and Temperature dependence characteristic of the In-Mg stacked films

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In the current work, an indium and magnesium thin films of thickness of 100 nm was deposited onto glass substrates and characterized by means of X-ray diffraction and UV-visible light spectrophotometry. The indium films are observed to be highly transitive with tetragonal type of structure. The temperature dependent X-ray diffraction analysis which were carried out in the temperature range of 303-403 K, has shown a stabilized grain size and strains for temperatures greater than 360 K. On the other hand, the Mg films are of amorphous nature and highly reflective compared to those of indium. The temperature show no effect on the crystalline nature of Mg. When the Mg coated In films were re-characterized. An inverse process of grain grow was observed. These variations which were associated with high reflectively were assigned to the recrystallization and recovery processes in the film.

Keywords: Indium; Magnesium; alloy; X-ray; stacking faults; grain size

Effect of Au/Ge substrate on the structural and electrical properties of GaSe film

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In this work, the effect of glass/Ge and Au/Ge substrate on the structural and electrical properties of the GaSe thin films is investigated by means of X-ray diffraction and impedance spectroscopy techniques, respectively. While the glass/Ge, glass/GaSe and glass/Ge/GaSe are observed to exhibit amorphous nature of structure, the Au/Ge, and Au/Ge/GaSe are of polycrystalline nature. In addition, the impedance spectroscopy measurements have shown that with the increasing frequency, the Au/Ge/GaSe/Yb interface exhibit increasing trend of variation in the resistance causing high impedance mode associated with negative capacitance values below 1300 MHz. The effect is completely reversed in the higher range of frequency. These features of the Ge/GaSe interface nominate it as microwave cavities and as voltage amplifiers in low power nanoscale devices.

Keywords: Au/Ge substrate, Ge/GaSe interface, structural properties, voltage amplifier.

Identification of the structural phases in TlInS2 doped with Selenium

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Recently, TlInS2 crystals are observed to exhibit Faraday Effect in which an interaction between light and magnetic field take place at 633 nm. As it presents an efficient magnetooptic material, we here in this work, report the X-ray analysis of the TlInS2 crystals doped with selenium. It is observed that the crystal structure of this material comprises two structural phases named monoclinic and tetragonal. The lattice parameters, microstrain, dislocation density, stacking faults and crystallite sizes are determined by means of modified Scherrer equations and with the help of “TREOR 92” software package. It is observed that, the crystallites built form tetragonal cells are larger in size than those built from monoclinic. In addition, all the mechanical parameters are accordingly attenuated in accordance with the cell type. The work is promising as it open the doors for using the TlInS3 crystals in applications where highly strained structures are required.

Employment of WKB approximation for investigation of the effects slowly varying energy barriers on the tunneling current of nanostructured devices

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In this study, we have employed the Wentzel–Kramers–Brillouin (WKB) approximation for exploring the effect of slowly varying energy barriers (φ) which usually exists in thin film devices at the nano level. Current conduction mechanism which is dominated by the quantum mechanical tunneling of charge carriers through irregularly shaped potential barriers are simulated assuming various mathematical potentials. These potentials which are experimentally observed to exist between grains at the grain boundaries of thin film devices exhibit deferent characteristics that depends on the barrier width (x), effective mass, barrier height and applied potential. It is observed that for potential barriers which are partially linear and mostly nonlinearly narrowing ($\varphi \propto (Ax - Bx^{-2})$), the lower the applied electric field the more dominant the tunneling current . This property indicate the possibly of using such nanostructured devices for establishing negative capacitance and negative resistance effect which are necessary for CMOS like devices.

Keywords: Slowly Varying Function, computer simulation, Tunneling device.

ZnSe/MoO_3 heterojunction and their characterization

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In this work the structural and optical properties of ZnSe/MoO_3 thin film are investigated by means of X-ray diffraction and UV spectrophotometer in the incident Wavelength range of 300-1100 nm. While the ZnSe substrate is observed to exhibit polycrystalline nature and the MoO_3 exhibit amorphous nature, the double junction doesn't alter the structural properties. On the other hand the analysis of the optical transmission and refleclectane spectra allowed determining the energy band gaps as well as the energy band offsets. While the conduction band exhibited an offset value of 0.1eV, the valence band exhibited a value of 0.8 eV. In the light of these parameters, the energy band diagram designed and presented. The band diagram displayed features that allow the quantum confinement which is set as a reason for the observed enhancement in absorption ratio.

Keywords: Quantum confinement, x-ray, MoO_3.

Investigation of the electrical properties of Indium Sulfide

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In this work , the electrical properties , of Indium Sulfide are investigated . The crystals are subjected to impedance spectroscopy analysis in the frequency domain of 10 – 1800 MHz . The Capacitance voltage – characteristics are also studied in the low frequency domain to construct the Ag/InS/Ag schottky device properties. In the light of these measurement it is possible to nominate the crystals as optoelectronic devices.

Temperature-Dependent Crystallization of CuSe Nanosandwiched with Au

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In this thesis, we have discussed the temperature assisted crystallization process in copper selenide thin films that are nanosandwiched with 25 nm thick Au layers. The CuSe films which are prepared by the thermal evaporation technique under vacuum pressure of 10^{-5} mbar are subjected to heating process while X-ray is monitoring the structure. It was observed that heating the samples above 383 k causes improved permanent crystallization of the hexagonal structure of the films. The permanent crystallization is presented by the growth of the grains, the reduction of micro strain, the decrease in the stacking faults and decrease in defect density. Testing the sample after cooling confirmed the permanent crystallization process.

The Fabrication of Mg2Pb Alloy

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In this short term work, we have considered the possibility of fabricating Mg2Pb alloys from the Mg metals and Pb nanopowder. The Mg2Pb alloy which was prepared through melting the row materials in a vacuum chamber under vacuum pressure of 10-5 mbar was initially mixed in a matter for more than two hours. The temperature of the melt was kept near 600ºC for few minutes. The x-ray diffraction on the resulting alloy have shown the formation of cubic phase of Mg2Pb being best oriented in the (111) direction. The lattice constant for the constructed alloy was 6.0 Å. The work also included the power diffraction data for the designed material with the most intensive reflection. In addition , the mechanical properties of the alloy are also calculated and reported

Zinc oxide micro-wires for optical and chemical sensing

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Antimony-doped ZnO (ZnO:Sb) micro-wires demonstrate a rich behavior and offer the potential for device applications. These micro-wires are affected by: changes in temperature, light, and the gas environment around the wire. For example, exposing the wires to light causes the resistance to drop significantly. The resistance then rises slowly when the light is turned off, so this effect is called 'persistent photo-conductance'. While ZnO is a wide band gap semiconductor, the photo-conductance in these wires is mainly due to the oxygen adsorption and desorption from the surface of the micro-wires. So, changing the micro-wire environment –through providing either a reducing or oxidizing gas- can affect the density of adsorbed oxygen atoms on the wire surface. Oxygen vacancies are n-type donors in these ZnO:Sb wires that cause the conductance to rise at the surface of the wire. This surface-sensitive conductivity can be the basis for an array of gas, light or temperature sensors. We will present our studies on the growth and the electric conductance of ZnO:Sb microwires.

In situ monitoring of the permanent crystallization, phase transformations and the associated optical and electrical enhancements upon heating of Se thin films

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In this work, the in situ structural transformations from amorphous to polycrystalline upon heating and the associated enhancements in the structural parameters of selenium thin films are studied by means of X-ray diffraction technique. The Se thin films which are grown onto ultrasonically cleaned glass substrate by the thermal evaporation technique under vacuum pressure of 10−5mbar exhibits structural transformation from amorphous to polycrystalline near 353K. The films completed the formation of the structure which includes both of the hexagonal and monoclinic phases at 363K. It is observed that the hexagonal phase dominates over the monoclinic as temperature is raised. Consistently, the thermally assisted crystallization process is accompanied with increase in the crystallite size, decrease in the microstrain, decrease in defect density and decrease in the percentage of stacking faults. The scanning electron microscopy measurements also confirmed the crystallinity of selenium after heating. The time dependent reputations of the crystallization test has shown that the achieved phase transitions and enhancements in structural parameters are permanent in selenium. Optically, the crystallization process is observed to be associated with redshift in the absorption spectra and in the value of the energy band gap. Electrically, the in situ monitoring of the electrical conductivity during the heating cycle has shown that the electrical conductivity stabilizes and exhibit a decrease in the acceptor levels from 566 to 321meV after the crystallization was achieved.

Keyword: Selenium, Thermal assisted crystallization, Hexagonal, Conductivity, Optical properties

Synthesis of Biocompatible Gold nanoparticles using cinnamon phytochemical as anti-cancer therapy: Experimental study.

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Cancer is the second leading cause of death globally and was estimated to account for 9.6 million death in 2018(According to WHO). To reduce the significant disability, suffering and deaths caused by cancer worldwide, effective and affordable programs in early diagnosis, screening, treatment, and palliative care are needed. Treatment options may include surgery, medicines and/or radiotherapy. In our research, we try to find a new way to treat cancer naturally. Toxic chemicals are utilized in several of the processes for production of nanoparticles, either in the form of reducing agents to reduce various metal salts to their corresponding nanoparticles, or as stabilizing agents to prevent agglomeration of nanoparticles. These toxic chemicals are powerful reducing agents that are currently used to produce gold and other metallic nanoparticles. These reducing agents are highly toxic to living organisms and to the environment. The purpose of the study was to study the effect of Cinnamon- Gold nanoparticles on cancer cells.

Graphene Oxide (GO) Sheets as Nano-carriers for Doxorubicin Encapsulated Nano-Liposomes enhances the therapeutic efficiency of the Drug Delivery Systems

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Cancer is a life-threatening disease contributing to ~3.4 million deaths worldwide. There are various causes of cancer, such as smoking, radiation, family history, environmental factors, and chance. In Chemotherapy, The systemic administration of the free drug is considered to be the main clinical failure in cancer treatment due to the limited drug concentration reaches the tumor site. Most of the active pharmaceutical ingredients used in chemotherapy are highly cytotoxic to both cancer and normal cells. Accordingly, encapsulation of anti-cancer drugs within the liposomal system offers secure platforms for the targeted delivery of anti-cancer drugs for the treatment of cancer. This, in turn, can be helpful for reducing the cytotoxic side effects of anti-cancer drugs on normal cells.
This study aims mainly to demonstrate the great potential of graphene oxide (GO) and membrane liposomes as nano-carriers in increasing the drug concentration in the tumor sites and reducing the cytotoxicity of the drug on normal cells. Graphene-Oxide (GO) layers (200 nm x 200 nm) have been used as a platform carrier for our established drug delivery systems. This is done through designing and preparing a new delivery system that employs

Doxorubicin Encapsulated Nano-Liposomes as drug carriers and graphene oxide (GO) as platform carriers. These formulations are new approaches that improve the therapeutic efficacy in cancer treatment due to their high capacity of drug loading. Furthermore, the two established delivery systems enhanced locating several liposomes on the surface of the GO nano-sheets leading to a higher Concentration of the loaded anti-cancer drugs in the tumor sites. The following spectroscopic techniques have been employed: FTIR Spectroscopy, UV-Visible spectroscopy and Fluorescence spectroscopy to confirm the success of system formulation, drug loading, binding capacity and anti-cancer drug release.
Keywords: Liposomes, Anti-cancer Drug, Drug Delivery, Graphene Oxide (GO), Doxorubicin.

Doxorubicin Targeted Nano Liposomes as New Drug Delivery System for Cancer Treatment: Spectroscopic Study

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Doxorubicin is a widely used anticancer agent; it is employed in the treatment of leukemia's, bladder, breast, stomach, lung, ovarian and thyroid cancer. Beside the desirable effects in treatment of hematological and solid tumors, its toxicity limits the use in therapy. Using Liposomes to encapsulate drugs avoids their distribution through healthy tissues and leads to the release of the medication exactly in the area of the tumor, reducing considerably the toxic effects. In this study, two Nano-liposomal Formulations have been established, followed by encapsulation with the anti-cancer drug Doxorubicin. Both, established delivery systems (Doxorubicin Targeted Liposomes) have been characterized using Fourier Transform Infrared Spectroscopy (FTIR) to achieve a deep understanding of the molecular mechanism of the interaction between the Nano liposomes from cell membranes and the delivered Doxorubicin. In addition, UV-Visible Spectroscopy has been used to calculate encapsulation efficiencies of the doxorubicin inside both established nano vehicles. Fluorescence Spectroscopy allows the calculation of two binding constants (K_{sv} and K_q), which have the ability to determine binding capacity and the release rates of the anti-cancer drug. Dynamics Light Scattering (DLS) has been employed to determine the size of our established nano-carriers, which are found about 100 nm in the presence of Doxorubicin. The two Nano-liposomal Formulations differ in their level of saturation; this difference in structure leads to the fact that the release of the Doxorubicin drug from both established nano-carriers shows different releasing rates. Hence we could contribute with two stable formulations for the cancer treatment based on the speed of releasing.

Keywords: Nano-Carriers, Liposomes, Anti-cancer Drugs, Doxorubicin, Drug Delivery


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