7th International Conference on MODERN TRENDS IN PHYSICS RESEARCH

20-24 April 2019

Abstracts & Projects Book

NANOTECHNOLOGY & APPLICATIONS
LASERS AND APPLICATIONS & HIGH POWER LASERS
NUCLEAR, HIGH ENERGY & PARTICLE PHYSICS
GEOPHYSICS
BIOPHYSICS

ATOMIC & ASTROPHYSICS

MTPR-018

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MTPR-018

20-24 April 2019

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INTRODUCTION

The MTPR-018 will be held as usual after two years of MTPR-018 on 20 April till 24 April 2019 at Cairo University. We shall be honored if you accept our invitation to participate and enrich the meeting with your latest research results. Your colleagues and students are also welcomed to this important meeting.

The GOAL & MOTIVATION of the meeting can be summarized as:

- Develop greater understanding of physics research and its applications to promote new services to the Egyptians
- Innovate knowledge about recent breakthroughs in PHYSICS fundamental and technological aspects
- State the existing possibilities to perform systematic studies on the vast fields of HIGH Density SCIENCE
- Consider methods for implementing local, regional and international cooperation in new trends in PHYSICS research
- Outline the needs to upgrade the performance of the PHYSICS research facilities in Egypt
- Verify & issue Memorandum of Understanding to select Basic PHYSICS a path towards the FUTURE
- Enable execution of the projects forwarded by INDIVIDUALS, GROUPS or AUTHORIZED Researchers for Novel PHYSICS Fields
- Reorganize plans for training graduate students
- DISCOVER future ways for developing countries to catch up with Modern Trends in Physics Research, in cooperation with advanced countries.

TECHNICAL PROGRAM:

MTPR-018 technical program will fall in 14 sessions 3.5 hours each. Sessions are parallel or combined, for oral presentation of invited papers and limited no. of contributed papers. Posters are encouraged for more time to scientific discussions.
TOPICES & SCOPE

TOPIC I: Lasers and Applications & High Power Lasers


TOPIC II: Condensed Matter, NanoTechnology & Applications


TOPIC III: Nuclear, High Energy & Particle Physics


TOPIC IV: Atomic, Astro, Bio and Geophysics

The encountered subjects could possibly be classified into:

**ATOMIC PHYSICS:** Iso-electronic sequences, Ionic states, Vibrational Levels, Spectroscopy...

**ASTROPHYSICS:** Experimental & OBSERVATIONAL ASTROPHYSICS AND COSMOLOGY
Theoretical, Galactic Black holes, gravity waves, Opacity, Interstellar medium, Climatology...

**BIOPHYSICS:** Physical approach to cell biology, Complex biological systems, computational & Theoretical biophysics, Protien engineering and synthetic biology, Genomics, Structural biology...

**GEOPHYSICS:** Mineral and Petroleum resources, mining geophysics to global exploration, global regional geodynamics, Seismology......
PROGRAM AT A GLANCE
SATURDAY 20 APRIL 2019

09:00 – 16:00 Arrival of Invited Speakers to Guest House

16:00 - 17:00 Registration, Cairo University Central Library

17:00 – 18:00 Opening at ALKACEMY Conference Theatre

18:00 – 18:15 TSLS ZEWAILS AWARD to WINNER

18:15 – 18:30 MEMORIAL to the Families of Professors:
FAWZY HAMED, MONA BAKR, MOHAMED EL OKR & HALA HUSNY

18:30 – 18:45 Medals TO Deans Supporting MTPR 1 – 7

19:00 – 19:30 Medals of Appreciation TO Invited Speakers

19:30 - 20:00 CONFERENCE PHOTOGRAPH

HEADING TO SHARM, 2 BUSES in front of CAIRO UNIV. will leave at 20:00. PARTICIPANTS are requested be on time
SUNDAY 21 APRIL 2019
AT SHARM EL SHEIKH

ARRIVAL TO ALGAFY HOTEL

UP TO 14:00 Room Habitation & Rest

14:00-15:00 LUNCH BREAK

SESSION 2 AT CONFERENCE HALL ALGAFY HOTEL

17:30 –18:00 INTRODUCTORY SPEECH LOTFIA
18:00 –18:45 KEYNOTE A. IONOV

SESSION 3

18:45 –19:30 KEYNOTE W. TAWFIK
19:30 –20:15 KEYNOTE O. SHALABEA
20:15 –21:00 KEYNOTE HEBA FAHMY

21:00-22:00 DINNER AT ALGAFY HOTEL

22:00 RECREATION AT NEAMA BAY SQUARE
MONDAY 22 APRIL 2019
AT SHARM EL SHEIKH

SESSION 4
9:00 - 9:45 KEYNOTE K. KHASANIN
9:45 - 10:30 KEYNOTE SULTANA NAHAR
10:30 - 11:15 KEYNOTE M. ELNAGDY
11:15 - 11:45 COFFEE BREAK

SESSION 5
12:15 - 13:00 KEYNOTE S. BOHZK
13:00 - 13:45 KEYNOTE M. HASSAN
13:45 - 14:30 KEYNOTE AHMED ASAAD
14:30 - 15:00 LUNCH BREAK AT ALGAFY HOTEL

SESSION 6
15:00 - 15:45 HONORARY MOSTAFA EL-SAYED
15:45 - 16:30 KEYNOTE MEDHAT IBRAHIM
16:30 - 17:10 PLENARY HISHAM IMAM
17:10 - 17:30 COFFEE BREAK

SESSION 7-8-9-10
17:30 - 18:00 INVITED PRESENTATIONS PARALEL
18:00 - 18:30 ORAL PRESENTATIONS PARALEL

SESSIONS 10-11-12
18:30 - 20:00 POSTER SESSIONS PARALEL
20:00 - 23:00 CONFERENCE BANQUIT
TUESDAY 23 APRIL 2019
AT SHARM EL SHEIKH

SESSION 14
09:00 - 9:45  KEYNOTE  LOTFIA EL NADI
09:45 -10:30  KENOTE  YEHIA ISMAIEY

10:30-11:15  CLOSING SESSION, CERTIFICATES &
SHEID..............

12:15-13:45  CHECK OUT THEN VISIT EL SOUK FREE SHOPPING

16:00..........BUSES...TRIP
BACK TO CAIRO........ INSA
MTPR – 018
SESSION 1: HONORARY PRESENTATION
Abstract:
Cancer kills many people after several years of suffering and after using a great deal of different unsuccessful treatments, like surgery, chemical and/or radiation treatments. The field of Nanotechnology showed us how different materials acquire so many different properties when their size is reduced to the nanometer scale. Gold nanoparticles having rod shape of nanometer size and a length: width ratio of 3:1 can absorb near infrared light (to which our body is transparent) and convert it into heat. If solution containing gold nanorods is injected into a cancer lump and exposed to near infrared light, the hot solution (resulting from the gold nanorods upon absorbing the near infra-red light) melts the cancer cells leading to their death. This was demonstrated by our group in photo-thermal destruction and destroying cancer cells in solution and in cancer lumps in small and large animals.\textsuperscript{1-5} Normally, some of the cancer cells that do not die are able to migrate to other parts of the body away from the location of their initial formation spot until they are located in a sensitive part of the body that leads to the cancer patient death. Thus, most of the cancer patients die from cancer after the cancer cells migrate by a process called metastasis to a more sensitive part of the body.
Very recently, however, we discovered\textsuperscript{5-6} that in our photo-thermal treatment, while treating cancer cells in the first cancer location with hot gold nano-rods, the cancer cell legs and arms and the motion proteins are photo-thermally destroyed. This makes it difficult for the cancer cells to migrate to a new more important functional locations in the body. This treatment is thus effective in stopping cancer cell migration through the patient body and increases the success rate of the patient's complete recovery.

References
MTPR – 018
KEYNOTE (KN) PRESENTATION
PLENARY (PL) PRESENTATION
INVITED LECTURE (IL)
Two-dimensional system - black phosphorus: electronic, atomic structure and transport properties of bP(100) single crystals

Ionov A.M., Zagitova A.A., Bozhko S.I., Kulakov V.I.
Institute of Solid State Physics, Russian Academy of Sciences, 142432, Moscow Region, Chernogolovka, st. Academ. Osipyana, 2,

Recently, greater attention has been paid to systems with reduced dimensionality. Two-dimensional materials, quantum threads, quantum dots, as well as hybrid structures, attract the attention of scientists for the reason that their properties often differ from the properties of a bulk material. Among two-dimensional materials, graphene, dichalcogenides of transition metals, and monoatomic layers of Si, Ge, Sn have also been extensively studied. As a promising two-dimensional material, black phosphorus was also proposed, the allotropic modification of phosphorus most stable under normal conditions.

Black phosphorus is a layered material in which atomic layers are held by weak van der Waals forces. The electronic, atomic structure and transport properties of black phosphorus (bP) single crystals prepared by high-pressure methods and a gas-transport reaction were studied by X-ray photoelectron spectroscopy (XPS) and scanning probe microscopy (STM, AFM).

Fig. 1 a) STM image of the P(100) surface (insets: profiles along the lines, Fourier image of the STM image (reflexes are indicated in Å), image of the unit cell with experimental parameters), b) STS spectra taken at four different sample points.

After exposure of the clean surface at atmospheric conditions, the features in the XPS spectra corresponding to the oxidized form of phosphorus were observed. The appearance of oxidized areas on the surface was also detected using AFM. The atomic resolution of the surface of a single crystal was obtained by the STM method. As a result of low-temperature transport measurements, impurity activation energies were determined, negative magnetoresistance along the Y direction was detected and discussed.
"The phenomenon of a powerful explosion of light".

Kholmurad Khasanov,

Moscow State M.V.Lomonosov University, Gas and Wave Dynamics Department, Moscow, Russia.

Samarkand State University, Nuclear Physics Department, Samarkand, Uzbekistan.

Abstract

In laboratory conditions, we detected a quantum high-frequency super-compressive field of space.

Recently, the Russian satellite named after Mikhail Lomonosov, launched in 2016 and integrated with the Kanopus-B spacecraft, equipped with an ultraviolet telescope, recorded an explosion of high-power light above tens of kilometers from Earth [1]. Director of the Nuclear Research Institute of Moscow State University named after M.V. Lomonosov interviewed, that detected explosion of light in the atmosphere is a new physical element. Surprisingly, the explosion occurred in a cloud free Earth’s sky. According to the scientists, discovered explosion of light in the atmosphere is a new physical phenomenon. This phenomenon cannot be explained within the framework of existing physical laws [2].

Registration of the quantum field space was carried out thanks to a dynamic emitter. A dynamic emitter of a special design created in which a supersonic air jet with a spiral-spherical structure formed when the gas jet expires in the flooded space. Dynamic emitter’s design published in the journals as "Fluid Dynamics" [3], "American Journal of Modern Physics" [4] and "Physics Letters A" [5], in which you can find a detailed description of the structure, as well as the formation of a spiral structure, super-compressed supersonic jets.

The quantum field of space recorded by optical methods using a Schlieren Photography method [6] and laser high-speed imaging [7]. As an example, we can demonstrate images of the explosion of light in the atmosphere during the outflow of a supersonic flow and its interaction with the detected quantum field of space where the explosion of light occurs in different spectral ranges. (Fig. 1,2,3).

Figure 1 The explosion of light in the interaction of a supersonic plasma stimulated by quantum super-compressive field of space. Visible in the turquoise, red and ultraviolet areas.

Figure 2 The explosion of light in the interaction of a supersonic plasma stimulated by quantum super-compressive field of space. Visible in the yellow, orange and solid regions of the spectrum.

Figure 3 The explosion of light in the interaction of a supersonic plasma stimulated by quantum super-compressive field of space. Visible in violet, ultraviolet, light brown and continuous regions of the spectrum.
The explosion of light in the atmosphere stimulated by quantum of high-frequency super-compressive field of space and the explosion of light in the atmosphere converge to the same physical nature having a single mechanism.

References


ULTRA INTENSE LASERS FORM THE SUN IN THE LABORATORY

Lotfia El Nadi ¹,²

¹ Physics Dept., Faculty of Science, Cairo University, Giza, EGYPT
² IC-HDL., National Institute of Enhanced Laser Sciences, NILES. Cairo University, Giza, EGYPT

mtprlotfia@gmail.com

ABSTRACT

Since their starting steps in 1985, Ultra Intense Lasers (UIL) have been developed to generate femto-second pulses with typical high performance parameters:

Peak Power up to~ 1000 TW = PW - Pulse Duration < 20 fs - Pulse Energy~ 2 Joules-Rep. Rate ~ 10 Hz- λ~ 800 nm

When such photons are properly focused on a target, creation of simultaneous exotic conditions within an extremely short time are developed, which have never been achieved before. Non linear optical processes are dominating and material is totally ionized providing large charge densities of around > 10²⁴ cm⁻³ and energetic electrons of 10³ to 10⁶ ev

FORMING THE SUN IN THE LABORATORY

Non equilibrium dynamics in a violently driven systems lead to Non- Maxwellian particle distribution and Gigantic magnitudes simulating the conditions expected for BLACK HOLES where: Magnetic fields of the order 10⁹ gauss, Electric fields of 10¹⁰ V/ cm, Pressures of the order 10⁹ bars and e⁻ Temperatures of the order of 10⁸ K are formed.

Ideal conditions to establish an UIL LABORATORY.
In this work, the generation of widely tunable ultrafast high-power laser system with pulse duration of a few-cycle fs pulses using a nonlinear laser interaction in neon-filled hollow-core fiber is demonstrated. The seed source is a 15-fs mode-locked Ti: sapphire of 400 mW and 75 MHz at 800 nm working in TEM00 mode. In this system, the amplification was done via a 1 KHz CPA regenerative-amplifier which produced 32 fs pulses of 2.5 mJ at 800 nm. Then output pulses were highly-compressed by self-phase modulation in an inert gas as a nonlinear medium through a one-meter hollow optical fiber. The dispersion compensation of these pulses was done via a pair of chirped mirrors. The observed pulses have controlled durations from almost 4 fs to <10 fs with power 0.1 TW and repetition rate 1 KHz as shown in fig.1. The characterization of ultrafast pulses in the regime of few-cycle pulses is considered using spectral phase interferometry for direct electric-field reconstruction (SPIDER) [1]. These pulses can be tuned from about 12 to 94 THz by varying the chirping of input pulses at different pressure of the inert gas. The observed results can give an opportunity to control the progression of strong-electric-field interactions on the ultrafast time scale and can be applied to regenerate attosecond pulses in the deep ultraviolet range. The observed results may give an opportunity to controlling the progression of strong-electric-field interactions on the ultrafast time scale and are crucial to regenerate attosecond x-ray pulses. Furthermore, the generated ultrafast laser pulses can be utilized in many applications in medicine and biology. Obvious areas of utilization include time-resolved imaging and fluorescence spectroscopy. Such investigations can be applied in cases involving tissue examination in the cardiovascular sector as well as applications within the field of malignant diseases [2], [3].

References:


On the performance of a flat plate collector

M. K. El-adawi, S. A. Shalaby, S. S. Mostafa, A. M. Abdelaziz
Physics Department, Faculty of Education, Ain-Shams University
Cairo, Egypt

Abstract:
Flat plate collector with thin absorber is studied. Heat balance equation is solved to estimate the temperature of the absorber and its variation along the local day time. The same equation is used to determine the temperature of the working fluid. A published expression to predict with good fitting the hourly global solar irradiance is considered as a source function for the incident solar energy. Three absorbers of different materials: Copper, Aluminium and Mica are considered. The water is considered as a working fluid. Two cooling conditions at the absorber front surface are considered. Factors affecting the efficiency are revealed.
Studying the effect of Plasmon coupling and their SERS performance for Ag @Au and Au@Ag core-shell free ligand prepared by laser ablation

G.Omar¹, Ola. S. Ahmed², H Imam ³, Mohamed M.Y. Elzayat⁴, Ahmed S. G. Khalil ⁴, Radwan G. Abd Ellah¹

¹ National institute of Oceanography and fisheries, Egypt
² National Cancer institute, Cairo University, Egypt.
³ National Institute of Enhanced laser NILES, Cairo University, Egypt.
⁴ Center for Environmental and Smart Technology, Fayoum University, Fayoum, Egypt
Corresponding author: hishamimam@niles.edu.eg

Abstract

In this work we synthesis bimetallic silver-gold nanoparticles (NPs) with different structures. Namely, \( \text{Au}_{\text{core}}\text{-Ag}_{\text{shell}} \) and \( \text{Ag}_{\text{core}}\text{-Au}_{\text{shell}} \) nanoparticles were synthesized in double distilled water by Pulsed Laser Ablation in Liquid (PLAL) without any stabilizers or surfactant. Although, laser ablation during surfactant is possible. The morphological and structural properties of the resulting bimetallic nanoparticles were thoroughly analyzed by TEM, DLS, and UV–Vis spectrophotometry. The plasmon band of the two core–shell NPs ranged from approximately 400 to 520nm. For \( \text{Au}_{\text{core}}\text{-Ag}_{\text{shell}} \) the plasmon band of core–shell NPs can be shifted to lower wavelengths (blue shift) by depositing a silver shell with increasing ablation time of the silver target. On the other side for \( \text{Ag}_{\text{core}}\text{-Au}_{\text{shell}} \) shifted to higher wavelengths (red shift) by depositing a gold shell with increasing ablation time of the gold target. Furthermore, UV–Visible optical absorption spectroscopy indicated the deviation of the surface plasmon resonance peaks with the Au and Ag shell by variation of the laser pulse ablation time, which affected the shell thickness. The HRTEM images clearly confirm the spherical colloidal stable with two different structures of the two core shell nanoparticles CS-NPs. The effect of cellular uptake of Au, Ag, \( \text{Au}_{\text{core}}\text{-Ag}_{\text{shell}} \) and \( \text{Ag}_{\text{core}}\text{-Au}_{\text{shell}} \) nanoparticles on cell adhesion/viability, cytotoxicity and morphology of Liver cancer cells culture (HePG2) have been investigated.

Keywords: PLAL; \( \text{Ag}_{\text{core}}\text{-Au}_{\text{shell}} \); HepG2 cell;
High Power Lasers for Determining the Level of Heavy metals in Egyptian fuel combustion power plants

Ahmed Asaad I. Khalil¹, and A.I. Hafez²

¹Chairman of Laser Sciences and Interactions Department, National Institute of Laser Enhanced Sciences, (NILES), Cairo University, Giza 12613, Egypt.
²Egyptian Electricity Holding Company, Cairo, Egypt.

*Corresponding author: E-mail: ahmedasaad68@yahoo.com, ahmedasaad@niles.edu.eg (A.A.I. Khalil)

ABSTRACT

We report on the spectroscopic analysis studies of the heavy metals content in different Egyptian fuel combustion power plant slags by employing high power lasers induced spectroscopic analytical technique (LISAT), energy dispersive X-ray analysis and inductively coupled plasma-optical emission spectrometry (ICP/OES) systems. The valuable metals were taken from the steam boiler bottom as solid waste residue for industrial recycling recovered. The investigated composition analysis by employing the calibration of the laser spectroscopic techniques established on the registered collection spectra of the plasma flare generated by high power lasers. We examined the impact of altered experimental parameters to enhance the sensitivity of our system. Moreover, the LISAT outcome accuracy in evaluating the heavy metals concentration in solid waste residues was validated using ICP/OES system. The predicted LISAT results were found good matching with the ICP/OES results. The influence of parameters like liquid/solid, mixing time, digestion temperature, concentrations of acid and alkali on heavy metals recovery was also studied. The proposed protocols elucidated that the brilliant profit of LISAT for identifying of valuable metals present in solid waste residue sample surface and for examining the quality and purity of recovering metal manufactures.

Keywords Furnace bottom sediments. LISAT. ICP/OES. Detection of valuable elements.
Identification Of Nuclear Mass Range Of Primary Event From The Observation Of Shower In Ultra High Energetic Cosmic Rays At Energy ~ $10^6$GeV

M. H. M. Soleiman $^a$, S. S. Abdel-Aziz $^a$, A. Abdelfattah Omar $^a$.

$^a$ Physics Department, Faculty of Science, Cairo University, Giza, Egypt.
Presented by: Dr. M. M. Soleiman

Abstract

Identification of mass numbers concerning the nuclei beginning the ignition of the atmospheric extensive air showers (EAS) is vital in the studies of Ultra High Cosmic Rays Interactions (UHCRI). The present study introduces a simple technique in processing the shower data at the height of detector level (1400 m over sea-level) to identify the nucleus starting the cascade of the shower. CORSIKA 7.6400, which is the EAS-generator is used to generate EAS data at detection level of 1400 m over sea-level and incidence energy ~ $10^6$GeV. The data are analyzed and the energy spectrum is obtained for the generated EAS. The EAS spectra for light nuclei ($^1$H and $^4$He), medium nuclei ($^{24}$Mg), and Heavy nuclei ($^{48}$Ti, $^{52}$Cr, $^{56}$Fe) are obtained, totally and with photons are subtracted. It is found that, the spectral slopes of the tail of the spectra with photons subtracted depend on the primary nuclei’s mass-number.

Keywords: Ultra High Cosmic Rays Interactions (UHCRI), primary event nuclei, CORSIKA, extensive air showers (EAS), spectral tail.
Dynamic of molecules in ultrathin C\textsubscript{60} film.

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The motion of single atoms or molecules plays an important role in nanoscale engineering at the single atomic or molecular scale. Effect of molecule center mass displacement on conductivity of C\textsubscript{60} based junction has been previously reported \[1\]. Understanding of molecular motion is crucial to further progress in molecule-based nano-electronic devices. The symmetry and deviations from a spherical shape of the C\textsubscript{60} molecule generate the rotational degrees of freedom which often determine physical and structural properties of compounds, C\textsubscript{60} based clusters and crystal. Scanning tunneling microscopy (STM) is one of the most promising techniques for imaging of prototype molecular devices and testing their properties.

We employed STM to reveal switching of individual C\textsubscript{60} between different orientations within a single molecular layer grown on the WO\textsubscript{2}/W (110)surface (Fig. 1a-e). Switching of the molecule between orientations resulted in a telegraph noise in tunneling current (Fig. 1d) or in Z position of STM probe. Statistics of switching has been used to determine energy gap and potential barrier height between two adjacent orientations of the molecule.

Rotational transitions in single molecular layer of C\textsubscript{60} were also studied. STM experiments were performed in temperature range 80K-320K. Rotational first order phase transition at $T_\text{C}=$260K has been established \[2\]. Above that temperature molecules continuously rotate around their centres of mass whereas below $T_\text{C}$ the rotational degree of freedom is suppressed and C\textsubscript{60} molecules undergo thermally activated switches between closely positioned energy orientations. The rate of jumps rapidly decreases with decreasing temperature and at 220 K the molecules stay in each state for longer than the time of a possible experiment. Therefore a kinetic glassy transition can be identified at 220 K. The glassy transition and nonexponential relaxation in solid C\textsubscript{60} are due to the freezing of weakly correlated orientations of nearest-neighbor molecules. The large number of different molecular orientations observed in the film results in an averaging-out of the interaction potentials and should cause Arrhenius-like relaxation processes. However, STM experiments reveal correlations in the nanomotion of the C\textsubscript{60} molecules that suggest arguments in favor of a constrain-dynamic scenario. The observation of a glassy transition at 220 K reveals a nonexponential relaxation in the C\textsubscript{60} monolayer. The Kauzmann temperature was estimated to be 45 K. Link of dynamics of individual molecules to the rotational transitions in the overall film discussed in a frame of mean field theory.


\[2\]Sergey I. Bozhko et.al. Rotational transitions in a C\textsubscript{60} monolayer on the WO\textsubscript{2}/W(110) surface, Phys. Rev. B. 84,195412, (2011)
Green and Novel Structure for Wastewater Treatment: Spectroscopic and Modeling Approaches

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Inorganic pollutants such as heavy metals find their way to the aquatic environment as a result of manmade activities. As a result of inadequate treatments such pollutants could be accumulated, which is in turn one of the well-known reasons for hazardous effects as they easily interact with the biological chain. New trends in controlling heavy metals are needed especially those of green origin. Among green methods for treatment of inorganic pollutants, phytoremediation is recommended owing to its green origin. Simply, it could be defined as using the plant in such a limited way as it could return the metals back to the environment. Natural polymers with dried water hyacinth are prepared in the form of microspheres for the remediation of heavy metals from wastewater. A patent has been granted in which microspheres are prepared from chitosan/water hyacinth. As chitosan is expensive, it was further replaced by sodium alginate, and then a solar drying system in addition to solar power is replacing electricity to minimize cost and save energy. The produced microspheres have then become cost effective and could remove inorganic pollutants from wastewater without returning it back to the environment.

The present talk will summarize the spectroscopic and modeling approaches in our group to prepare water hyacinth/natural polymers microspheres for the remediation of heavy metals.

Keywords: Water hyacinth; Microsphere; FTIR; Molecular Modeling.
Design of Novel Device for Testing Gas Sensors

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Gas-sensing devices have been developed for the detection of numerous target gases as well as volatile compounds. The present talk deals with design and performance of device for testing gas sensors for gases and volatile organic compounds measurements. The device consists of test cylinder made of Pyrex whereas the sensor will be inside it. The sensor is close to heater, the cylinder is connected with two inlets for test gas and carrier gas, and also there are valves for gas inlet and/or outlet. The sensor in the cylinder is connected with ohmmeter and computer for recording the results. The device is proved to be sensitive for testing sensor for gases and organic volatile compounds, also the concentration of the gas is precisely determined.

Keywords: Gas sensor; Testing sensors; Gas chamber and Volatile gases.
Angular Distribution and Transverse Momenta of Projectile Fragments of Oxygen Nucleus Collided With Emulsion at 3.7A GeV

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Abstract

Transverse-momentum distributions of the residual charges due fragmentation of $^{16}$O projectile nucleus with emulsion at 3.7A GeV are investigated. The experimental parameters that study the mechanism responsible for projectile fragmentation are discussed. The angular distributions of all possible charges due to projectile fragmentations for $^{16}$O nucleus are recorded and compared that obtained for $^{12}$C, $^{22}$Ne, $^{24}$Mg and $^{28}$Si at the same collision momentum. The effects of target size on fragmentation process for both $^{16}$O and $^{24}$Mg projectiles are studied. The experimental results show that there is unified mechanism of projectile fragmentation in this range of masses and energy.
“TOWARDS A GREEN WORLD: THE POWER OF NANOTECHNOLOGY”
Heba Mohamed Fahmy
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The safety of the environment leads to better quality of life to all the creatures. Nanotechnology is now intervening in many applications such as: industrial, medical, agricultural fields and no one can imagine the current world without the different applications of nanotechnology which greatly enhanced our lifestyle. Nanotechnological products, procedures and applications are needed to contribute significantly to environmental and climate protection by saving raw materials, energy and water as well as by cutting greenhouse gases and hazardous wastes. Using nanomaterials therefore promises certain environmental benefits and sustainability effects. Even so, nanotechnology currently plays a rather subordinate role in environmental security, whether it be in research or in practical applications. In this talk, I will start my speech by pointing out what did we expected from this technology and whether our expectations come true or not. I will give special attention for talking about the dark sides of nanotechnology and how nanotechnology can lead to negative impact on the environment. I will end my talk by pointing out the benefits of nanotechnology to the environment with giving specific examples for that, such as: obtaining new and cheap new energy sources, recycling some hazardous materials and returning them into beneficial products. I believe that greener environment equals better future and easier life.
Simulation of Fusion Reaction of Ultra High Power Laser Accelerated Protons with Boron Nuclei

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ABSTRACT

In the process of the interaction of Ultra Intense Laser (UIL) beams with Plastic targets, it was proved to efficiently bunch accelerated Hydrogen ions [1, 2]. The efficient Radiation Pressure Acceleration (RPA) mechanism [3, 4, 5, 6] for laser-based ion acceleration, could explain the production of bunches of solid state density through the hole-boring mode [7]. Allowing such dense bunches of Hydrogen ions i.e. protons to impinge on a second thicker Borated Polyethylene target would easily result in fusion of the UIL Laser accelerated protons with the B¹¹ nuclei, resulting in highly excited fused carbon nuclei. Such fused species would soon disintegrate by evaporating light particles or by fission into relatively lighter fragments. In this scenario the first target could well be polyethylene foil of thickness less than 500 µm and would be considered the source of the accelerated Hydrogen ions or protons. The second target would be expected to contain C¹² compound nuclei by p¹ + B¹¹ ----. C¹² fusion as well as lighter nuclei due to fission of C¹² nuclei.

In the following we propose to estimate the possibility of producing important non emitting neutron nuclei such as B isotopes and or Alpha particles in the second Borated polyethylene target. Simulation of fusion, followed by particles evaporation, is elaborated applying Mont Carlo code PACE-4 [8]. In this Contest a planned experiment will be briefly introduced, where the production of such nuclei and the experiment to measure their properties will be elaborated.
Fabrication and Optical characterization of Ultrathin Graphene Oxide thin Films Using an Integrated technique between Layer-by-Layer Assembled and Spin Coating methods

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Abstract

Although the large-scale graphene oxide material production via bulky routes, graphene oxide (GO) still represents less than half of the global market. The primary reason behind this trend is the limitation of reconducting a homogeneous thin-film from scattered nanosheets that are generated with robust methods to match the industrial facilities. In this paper, a large-scale graphene oxide (GO) layers were synthesized by a simple facile technique through merging approach between the layer-by-layer assembled (LBL) and spin coating (S) techniques. The growth conditions were also correlated with optical performance for three different GO accumulations, which the thin-film with 8 layer (GO8) showed adequate optical performance corresponding to a successful building layer from GO flakes with minor defects. The crystalline, electronic, and morphology structure of prepared GO films are confirmed via XRD, FTIR, Raman spectroscopy, SEM and AFM respectively. Finally, these as-produced GO thin-films can increase the utility of GO usage in several applications.

Keywords: X-ray, FTIR, Raman spectroscopy, SEM, AFM, Energy gap, and Complex refractive index.
PRODUCTION NEUTRALINO AND TWO HIGGS BOSONS FROM ELECTRON-POSITRON ANNIHILATION VIA $H^0$ AND $Z^0$ PROPAGATORS

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Abstract

The cross-sections $\sigma$ (pb), in electron (e$^-$) - positron (e$^+$) annihilation, are calculated over range of center of mass energy $S$ (Gev) for the process: $e^+(P_1) + e^-(P_2) \rightarrow H^0_i(P_2) + H^0_j(P_3) + \tilde{\chi}^0_\ell(P_4)$. There are two groups of Feynman diagrams are taken into consideration depending on the types of the propagators, Group (a) Production of $H^0_i$, $H^0_j$ and $\tilde{\chi}^0_\ell$, when $Z^0$ and $H^0$ are the propagators, and Group (b) Production of $H^0_i$, $H^0_j$ and $\tilde{\chi}^0_\ell$, when $H^0$ and $Z^0$ are the propagators, where $i,j = 1,2,3,$ and $\ell = 1,2,3,4$. There are (288) different possible situations. The cross sections for this process are calculated carefully according to a selected set of parameters. Then graphed and tabulated, The production cross-sections values mechanisms can be detected as:

$e^+(P_1) + e^-(P_2) \rightarrow H^0(P_2 + P_3) \rightarrow H^0_i(P_2) + H^0_j(P_3).$

$e^+(P_1) + e^-(P_2) \rightarrow Z^0(P_2 + P_3) \rightarrow H^0_i(P_2) + H^0_j(P_3).$

At S interval (1200 - 1600) Gev, the best value of $\sigma$ is (28x10^2) Pb in group (a). When each masses of Higgs bosons ($m_{H^0_{i,j}} = 125 Gev/c^2$) and the Neutralino mass ($m_{\tilde{\chi}^0_\ell} = 700 Gev/c^2$).

Keywords: Higgs bosons, neutralinos, and Dark matter.
Correlation between Structural and Electrical Properties of Polyvinylidene Fluoride in the Pure State and with some Additives at Different Temperatures

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Abstract
Synthetic (SrTiO$_3$) has a very large dielectric constant at room temperature and low electric field. Aiming to increase the dielectric constant of PVDF, a different amount of SrTiO$_3$ are added to it. A correlation between structural changes and the physical properties of these composites was elucidated. The effect of doping with SrTiO$_3$ on electrical conduction in PVDF was undertaken. The effect of SrTiO$_3$ doping in PVDF on the dc electrical properties as well as the electrical conduction mechanisms was studied. The dielectric properties of PVDF as a function of SrTiO$_3$ doping and both temperature and applied frequency was elucidated. Finally, the structural changes in PVDF matrix owing to SrTiO$_3$ doping via IR and XRD spectroscopy was presented.
Temperature Effect on the Performance of Diode Pumped Nd- Yag Solid State Laser System

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We had used a compact Nd:YAG solid state laser in our laser system which consists of: pumping diode laser, collimating lens, dichroic mirror, Nd:YAG crystal, saturable absorber, Q-switching, KTP crystal, infrared filter, output coupler mirror, heater, power meter and spectrometer.

Measurements were carried out for power and intensity of the emitted laser beam together with the input power. The spectrum and the power of the diode excitation source has been examined before carrying out the experiment. Temperature effect was examined using a small oven for heating the laser Nd: YAG laser compact system using high accuracy temperature controller. We measured the output laser power and spectrum profile of laser wavelength at 532 nm and 536.1 nm the second harmonic of 1064 nm of Nd: YAG laser crystal at different temperatures 30-65 centigrade. We obtained relation between temperature and laser power which reveals that we had an optimum output laser power at 35 and 40 degree centigrade. The optimum spectrum was found at the same pervious degrees. We obtained the laser efficiency at different temperatures.
Fast Diagnoses of Cancer by Isotopic Variations Detection in Blood Samples Using Laser spectroscopic Technique


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Abstract

The early detection of cancer is of prime importance with respect to treatment and patient survival. Biopsy techniques that are currently employed for such diagnosis are invasive and time consuming. Isotopic analysis is essential in medicine, chemistry, materials science, radiochemistry, archeology, and nuclear non-proliferation. Isotopic data provide answers to fundamental questions related to research and development in these disciplines as well as providing important insight into more applied fields. A new method of performing optical isotopic analysis of condensed samples in ambient air and at ambient pressure will be developed: Laser Induced Breakdown Spectrometry (LIBS). This technique is currently a subject of great interest in spectroscopy and is being considered for the design of a field portable unit for nuclear safeguard inspection, because it allows a high level of portability and versatility while identifying the elements and materials of interest. The new method can determine not only chemical composition but also isotopic ratios of elements in the sample. Isotopic measurements are enabled by significantly larger isotopic shifts found in molecular spectra relative to atomic spectra. No sample preparation or pre-treatment is required. Detection of the isotopes of copper, zinc and sulfur will be discussed to illustrate the isotopes ratio of these elements as marker for cancer type. It is possible to build a model that enables the accurate determination of the isotopic ratio under conditions for elements of interest would not be achievable without the use of ultra-high resolution spectrometer. The performance obtained with such a LIBS sensor configuration demonstrates the possibility of integrating all of the required components in a small portable handheld system. That will lead to make the whole investigation of cancer type and grades using a new developed technique.

Keywords: LIBS; Cancer; Isotopes
Comparative study of the effect of fs, ps, ns Lasers on the gold, CdS thin films and Mo, Ti Using laser produced plasma (LPP) and pulsed laser deposition (PLD).

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Abstract: Pulsed laser deposition thin films (PLD) is used for preparing gold, and Cadmium Sulphid (CdS) thin films using different laser sources. Three types of lasers with different wavelengths and pulse duration time including the femtosecond picosecond, and nanosecond (fs, ps, ns) are used for carrying these study. Nd-Yag laser 1064 nm and its double frequency pulses at 532 nm of 8 ns pulse duration time, ps laser pulse at 800 nm wavelength and 200 ps pulse duration time, fs laser pulse at 800 nm wavelength and 40 fs duration time are used. Nd – Yag Laser of 1064 nm is used for preparing CdS thin films under high vacuum 10^{-6} mbar. These thin films which are deposited by these three types of laser pulses are studied using Atomic Force Microscopy (AFM), Scanning Electron Microscopy (SEM), Energy Dispersive X-ray Spectroscopy (EDX) and XRD. The results are showed formation of gold particles for all the three laser pulses, but it was noticed gold thin films in case of femtosecond laser pulse are formed in more symmetric manner than in case of using the ps and ns laser pulses. The effect of increasing of the fs laser power has increased the thin film density. Photoconductivity, XRD of CdS thin films of different thickness and temperature are measured. laser produced plasma using Nd-yag Laser interaction with Titanium Ti and hollow cathode of Molybdenum (Mo) under applied electric field and without are carried out.Electric probe and faraday cup collecting charge are used in plasma diagnostics. The electron Temperature, Electron density, ion velocity distribution function of multi charged ions, ion temperature, ion density are obtained. Laser produced plasma spectroscopy (LPPS) of CdS, Titanium and Mo has been measured which gave the high accuracy of the plasma parameters obtained.
III- INVITED PRESENTATIONS
Correlation between Structural and Electrical Properties of Polyvinylidene Fluoride in the Pure State and with some Additives at Different Temperatures.

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Internal friction is a very important mechanical property of matter which can be determined by many techniques, such as the pulse excitation technique and the torsional pendulum. In this paper we used the pulse excitation technique as it is non-contact, easy used and not affecting the sample, reliable, low cost, and accurate and suiting a wide variety of rubbery materials and elastomers. The samples chosen for this work is made of butadiene acrylonitrile rubber (NBR), which are loaded by different phr of N774 nanocarbon. The measured sample is prepared in form of 200 mm long string, having a homogenous circular cross-section of 3 mm diameter. A mechanical pulse is produced and delivered to the fixed end sample by mean of a punch from a small solenoid motor plunger. To generate a shadowgraph for the vibrating sample on a silicone photodiode, a laser beam is used. A storage oscilloscope is used to capture the natural resonance amplitude decay profile of the test sample from the obtained electric signal. The internal friction is obtained by mathematical analysis of the acquired data.
Identification of Nuclear Mass Range of Primary Event
From The Observation Of Shower In Ultra High Energetic Cosmic Rays At Energy ~ 10^6 gev

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Abstract: Identification of mass numbers concerning the nuclei beginning the ignition of the atmospheric extensive air showers (EAS) is vital in the studies of Ultra High Cosmic Rays Interactions (UHCRI). The present study introduces a simple technique in processing the shower data at the height of detector level (1400 m over sea-level) to identify the nucleus starting the cascade of the shower. CORSIKA 7.6400, which is the EAS-generator is used to generate EAS data at detection level of 1400 m over sea-level and incidence energy ~ 10^6 GeV. The data are analyzed and the energy spectrum is obtained for the generated EAS. The EAS spectra for light nuclei (^1H and ^4He), medium nuclei (^{24}Mg), and Heavy nuclei (^{48}Ti, ^{52}Cr, ^{56}Fe) are obtained, totally and with photons are subtracted. It is found that, the spectral slopes of the tail of the spectra with photons subtracted depend on the primary nuclei’s mass-number. Keywords: Ultra High Cosmic Rays Interactions (UHCRI), primary event nuclei, CORSIKA, extensive air showers (EAS), spectral tail.
IV- ORAL PRESENTATIONS
Graphene growth on Cu foil and Ni/Cu surface at low temperatures by pulsed laser deposition

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Graphene has attracted much of interest due to its remarkable physical, optical, and electronic properties. The outstanding features of graphene such as high mechanical strength, quantum electronic transport, and tunable bandgap have multiple applications in industry and electronic devices. Pulsed laser deposition (PLD) is a versatile technique and got considerable impulsion because of its applications in the synthesis of high quality single crystalline materials of technological significance. In this work, study of graphene growth on commercial Cu foil and Ni/Cu surface substrates under high vacuum were carried out by Nd:YAG laser with a wavelength of 1064 nm and laser energy of 50 mJ. The base pressure during the deposition was ~1×10⁻⁵ Torr. Effects of growth conditions; temperature, surface structure, and cooling rate on the ability to fabricate graphene layers were investigated by Raman spectroscopy and x-ray diffraction (XRD). PLD growth of graphene layers indicated that surface mediated growth have a catalytic role despite of the presence of Cu(200) and Cu(111) facets. Raman spectra indicate that synthesis graphene layers rely on the surface quality of substrate together with the proper cooling profile coupled with graphene growth temperature. Surface mediated growth of graphene on Cu foil substrate revealed to have favorable catalytic effect. The results show dependent of the grown graphene on how PLD introduced Ni into Cu substrate, which was relied on the laser energy and substrate heating procedure. This work suggests that PLD growth can be integrated with other deposition systems to have the selection to fabricate graphene for the required applications. Details of few layers graphene growth successfully at low temperatures are given and discussed.

Keywords: pulsed laser deposition, graphene, low temperature growth.

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Abstract

Studying the types of observed twilights according to image analysis taken by Canon EOS 20D camera were carried out during 13-16 Jan2016 in Aswan Egypt (desert land). It is found that, there are two types of twilights. A) Astronomical twilight called also Pseudo-Dawn (non-thread bright): caused by Zodiacal light or the solar radiation reflection from the asteroid belt, and interplanetary matter when the solar depression is approximately in the range 19.5°-16.5° (18° in average). It is not appeared in all days of our study, it appeared only in days 14 and 15 when solar depression angles were -17.54° and -18.88° respectively. B) Solar twilight (morning white thread): produced from the solar radiation directly at the depression angle of the Sun is nearby 15° before sunrise and 16° after sunset. Solar twilight occurred when Sun's depression angle at -15.56°-15.56°, 14.93°, -15.38°, -14.53° in current studying period. Starting time of the solar twilight is slightly differs from naked eye about ~1°. It is found that the astronomical twilight starts brighter and vertically wider than solar twilight. Astronomical twilight starts at altitude 8° with vertical thickness ~30°, while, solar twilight starts at altitude ~3° with thickness about 1-2° only.

The solar twilight of the morning can be divided into three stages: a) Darkness (Fajr) occurs at a depression angle of the Sun nearby change to about(16° - 12°). b) Semi-darkness stage (Ghalas): in-between stage, occurs at a depression angle nearby change to about(12° - 5°). Twilight has a grey color. c) Lightning stage (Isfar): pre-rising, occurs at a depression angle nearby change to about (5°-0°) with reddish twilight color. Because of the difference in chromospheric thickness, temperature and composition at sunrise and sunset occurrence, twilight color starts white for sunrisetwilight and ends red for sunsettwillight.

Keywords - Solar twilight; Astronomical twilight; Naked eye; Zenith; Sun's vertical depression; Sun's altitude; chromosphere; troposphere; Solar radiation; Dawn; Pseudo-Dawn.
Crystal Structure, Characterization and Physical Properties of some 2D Organic-Inorganic Hybrid Perovskites of The Formula $[\text{NH}_3(\text{CH}_2)_n\text{NH}_3]\text{MCl}_4$, $\text{M} = \text{Co, Mn}$, $n = 4, 5, 9$

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Great attention has been devoted to the preparation and characterization of organic-inorganic hybrid perovskites (OIHs). These advanced materials can provide low cost materials for self assembly quantum well applications, fuel, solar cells, batteries, electronic and optoelectronic applications. Diammonium halide perovskite hybrids $[\text{NH}_3(\text{CH}_2)_n\text{NH}_3]\text{MCl}_4\text{Br}_{4-x}$; $x= 0, 2, 4$; $\text{M}= \text{Co, Mn, Cu}$ allow mixing of organic and inorganic components in one molecule which possesses a property that may not exist in either of the parent components. Possibilities could elaborate hybrid materials in terms of processing new chemical and physical properties according to the application needed. Single crystals were prepared by slow evaporation. The complete structure information as well as lattice parameters for Co hybrid $n = 4$-$5$ are provided, and $n = 5$-$6$ for Mn hybrid. Differential thermal analysis DSC shows reversible solid-solid phase transition for both the Co and Mn hybrids. Permittivity studies confirm the phase transition. FTIR at different temperature are discussed.

Fig.1. left panel Crystal structure of $[\text{NH}_3(\text{CH}_2)_4\text{NH}_3]\text{CoCl}_4$, XPS raw spectra of $[\text{NH}_3(\text{CH}_2)_9\text{NH}_3]\text{CoCl}_4$ and right panel crystal structure of $[\text{NH}_3(\text{CH}_2)_6\text{NH}_3]\text{MnCl}_4$
Electronic structure and chemical bonding in Co, Mn OIHs were studied by X-ray (XPS) photoemission spectroscopy. All elements of Co and Mn organic-inorganic hybrid perovskites were found in XPS spectra and can be related to the peaks of N1s, C1s, Co2p, Mn2p and Cl2p. Wide peak of C1s spectra was related to the chemically unequivalent C atoms in the compounds. The spectrum of the N1s level with binding energies of 401.2 eV was assigned to NH$_3$-group. The analysis of Co2p states in Co OIHs compounds shows the divalent state of Co with a typical satellite structure.

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V-POSTER PRESENTATION
EFFECT OF COLD PLASMA ON THE CHARACTERISTICS OF DPPC LIPOSOMES

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Abstract

Cold atmospheric plasma (CAP) has many promising applications in biomedical engineering, dentistry and oncology. This study investigates the effect of CAP on 1,2-dipalmitoyl-sn-glycerol-3-phosphocholine (DPPC) liposomes prepared by the thin film hydration method which are used as a model for lipid bilayer membrane. DPPC liposomes were exposed to cold plasma 2, 3 and 5 minutes. The effects of cold plasma on DPPC characterization parameters such as size, charge, FTIR absorption spectrum, UV-visible spectrum and phase transition temperatures were investigated. Exposure of DPPC liposomes to CAP led to an increment in the size and stability of liposomes by increasing the exposure time. 2-min CAP exposure was found to increase liposomal size through particle aggregation, whereas, 3 and 5 min exposure increases the liposome size via adsorption of negative species emerging from CAP on their surfaces. As depicted from differential scanning calorimetry (DSC) results, the electrostatic interaction between the CAP species and phospholipids acyl groups of DPPC resulted in the change of DPPC conformation. The hydrocarbon chains of lipid molecules arranged more closer, especially with increasing the exposure time. Thus, it can be concluded that CAP alters the physical and chemical characteristics of DPPC liposomes.

Keywords: Cold plasma, DPPC liposomes, Zeta potential, phase transition, liposome size.
The potentiation of the antidepressant effect of Thymoquinone by loading it on Chitosan nanoparticles coated with polysorbate 80

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Abstract

The present study aims to evaluate the antidepressant effect of different formulations of Thymoquinone; free Thymoquinone (TQ), Thymoquinone-loaded Chitosan nanoparticles (TQ-TPP-Cs NPs) and Thymoquinone-loaded Chitosan nanoparticles coated with polysorbate 80 (TQ-TPP-Cs NPs-PSb80) that have been prepared to avoid the low bioavailability of TQ. Rats were randomly divided into control rats, rat model of depression induced by reserpine, rat model treated with TQ, rat model treated with TQ-TPP-Cs NPs and rat model treated with TQ-TPP-Cs NPs-PSb80. The prepared formulations were characterized for size, morphology, encapsulation efficiency and in vitro drug release before their use in treatment. The transmission electron microscope analysis confirmed that TQ-TPP-Cs NPs and TQ-TPP-Cs NPs-PSb80 were nearly spherical, having sizes of 44±1.9 and 74.66±5.6, respectively. The mean zeta potential for TQ-TPP-Cs NPs and TQ-TPP-Cs NPs-PSb80 was 30.9±3.02 mV and 3.89±2.23 mV, respectively. The TQ encapsulation efficiencies for TQ-TPP-Cs NPs and TQ-TPP-Cs NPs-PSb80 were 75.67% ± 17.03 and 85.61% ± 1.02, respectively, while the loading capacities were 14.093% ± 4.61 and 16.26% ± 1.2 for TQ-TPP-Cs NPs and TQ-TPP-Cs NPs-PSb80, respectively. The release of TQ from TQ-TPP-Cs NPs and TQ-TPP-Cs NPs-PSb80 was rapid during the first 4 hrs and was followed by a sharp decrease during the next 72 hrs.

Reserpine induced a decrease in motor activity and swimming time and increased immobility time as indicated from the open field test (OFT) and forced swimming test (FST). In addition, a significant decrease in the monoamine neurotransmitters serotonin (5-HT), norepinephrine (NE) and dopamine (DA) was recorded in the cortex, hippocampus and striatum of reserpine-treated rats. The results indicate that TQ-TPP-Cs NPs loaded with polysorbate 80 was more efficient in ameliorating the behavioral and neurochemical changes induced by reserpine than TQ and TQ-TPP-Cs NPs. The present data suggest that the antidepressant efficacy of TQ could be enhanced by loading it on Chitosan nanoparticles coated with polysorbate 80.

Keywords: Thymoquinone, Chitosan nanoparticles, polysorbate 80, depression, monoamines, rat.
EVALUATION OF THE POTENCY OF CHITOSAN-PALM POLLEN MIXTURE ON INCREASING THE FRUITS SHELF TIME

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The balance between preserving food as economic solution and keeping nutrient content is a real challenge. However, the unique criteria of Chitosan made it a promising solution, that's why we intent to preserve mandarin orange and banana fruit from oxidative damage, microbial growth and, microbial toxins for relatively long period by coating fruits with a coat using low and high molecular weight Chitosan-antimicrobial and biodegradable material with different concentrations along with the extract in one hand and with palm pollen grains extract in another one and comparing the influence of those additives on contaminated and uncontaminated fruits to investigate whether they will be protected from fast deterioration at room temperature or not. We hope to be able to extend the shelf life of the fruit, keeping its nutritive value and protecting it from fungal contamination. The positive achievement out of this investigation may be generalized further to include different fruits and vegetables preserved in their very nature form.

Keywords:
Mandrian orange fruit; Chitosan; pollen grain; shelf time; antimicrobial
DIELECTRIC SPECTROSCOPY SIGNATURE FOR CANCER DIAGNOSIS

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Abstract

The effective clinical management of cancer is entirely dependent on the detection at a suitable early time as well as on the proper diagnosis. The main aim of this review is to survey the applications of dielectric spectroscopy in the clinical cancer diagnosis and distinguishing between normal and tumor tissues. This review focuses on recognition of the biophysical properties of normal and malignant tissues and also of biophysical changes elicited by cancers comprising (breast, liver, thyroid gland, lung, skin, prostate, and bladder) tumors. These biophysical changes are often produced because of the difference in tissue composition, blood flow, and architecture between normal and malignant cells. From the literature, it has been observed that dielectric spectroscopy method can be applied before, during or after tumor surgery; and most of the results are confirmed by conventional analysis such as histopathology. Moreover, by dielectric spectroscopy technique, dielectric parameters, especially conductivity and permittivity were suggested to be biomarkers for discrimination cancerous patients of the mentioned cancer types. It could be concluded that dielectric spectroscopy rapidly provides the biophysical status of normal tissues and cancerous ones and thus can be applied effectively for the early diagnosis and detection of cancers.

Keywords: Dielectric spectroscopy; biophysical properties; cancer diagnosis; permittivity; conductivity.
ELECTROPORATION AS A NOVEL METHOD FOR FLUOXETINE LOADING

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Abstract

For the treatment of diseases, not only the drug industry is important, but how to target the drug to the affected area with minimal damage and the highest concentration is what scientists are interested in. This project aims to apply a more effective and less expensive method of delivery of fluoxetine (FLX) which is used as a treatment for depression but has terrible side effects on the human body. The method depends on applying the technique of electroporation on FLX-loaded liposome. The project is divided into two phases, the first is to enter FLX into non-doped DPPC-liposome using electroporation, and the second phase is the use of electroporation for the entrance of FLX into DPPC liposome doped with silver nanoparticles. The present study extends also to compare the results of the two phases and find out which method and what kind of liposome is better to transport the drug with higher encapsulation efficiency.

Keywords: Electroporation; Fluoxetine; Liposome; Encapsulation efficiency; Nano silver.
Evaluation of the Cytotoxicity of Thymoquinone-Encapsulated Dppc Liposome for the Inhibition of Prostate and Laryngeal Cancer Cells

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Abstract:

A great challenge that we affront nowadays is to treat cancer cells without affecting healthy cells. In the present work for the first time, the cytotoxicity effect of free Thymoquinone (TQ) and TQ-encapsulated DPPC liposome was evaluated on prostate cancer cells PC-3 and larynx cancer cells HEP-2 for 24 and 72 hrs, respectively, using MTT assay. TQ (the main active gradient of Nigella sativa) was chosen because of its well-known antioxidant, anti-inflammatory and anticancer activities in vitro. DPPC liposome was prepared by the thin film hydration method and its encapsulation efficiency for TQ exceeded 90%. The TQ-encapsulated DPPC liposome was characterized by FTIR, UV-Vis spectrometer, particle size, DSC in addition to zeta potential. From the present results, it was found that treatment of PC-3 and HEP-2 cells with free TQ for 24 and 72 hrs at 37°C resulted in at least 70-85% inhibition of cellular proliferation without affecting their viability. On the other hand, TQ-encapsulated DPPC liposome exhibited similar inhibitory effect only at 10-fold higher dose. It is recommended to develop liposome formulations with improved targeting ability to further improve the efficacy of TQ in vivo.

Keywords: Prostate cancer cell PC-3; larynx cancer cell HEP-2; Thymoquinone; cytotoxicity; encapsulation; liposomes.

Presenters: Taiseer Mohamed Abd Eldaim, Ayaat Mahmoud Mosleh, Omnia Eid Ali.
BIODISTRIBUTION AND TOXICITY ASSESSMENT OF COPPER NANOPARTICLES IN THE RAT BRAIN

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Presenter: Asmaa A Hassan.

Abstract

The increase in the usage of copper nanoparticles (CuNPs) in the industrial and medical fields has raised concerns about their possible adverse effects. The present study aims to investigate the potential adverse effects of CuNPs on the brain of adult male Wistar rats through the estimation of some oxidative stress parameters and acetylcholinesterase (AChE) activity. CuNPs were prepared and characterized using different techniques: Dynamic Light Scattering, X-Ray Diffraction, Transmission and Scanning Electron Microscopy, Fourier transform Infrared Spectroscopy, in addition to Energy Dispersive X-ray Spectroscopy. Rats were divided into two groups: CuNPs-treated group (IV injected with 15 mg/kg 13 nm CuNPs for 2 successive days) and a control group (injected with saline). Rats of the 2 groups were decapitated simultaneously after 48 hours of the last injection. The Cu content in different brain areas was analyzed using inductively coupled plasma mass spectrometry. Moreover, the effect of CuNPs on brain edema was evaluated. The behavior of rats in an open-field was also examined 24 hours post the last injection. Significant increases of Cu content in the cortex, cerebellum, striatum, thalamus and hippocampus was found. Moreover, CuNPs lead to the induction of oxidative stress condition in the thalamus, hypothalamus and medulla. In addition, CuNPs induced significant increases in AChE activity in the medulla, hippocampus, striatum besides midbrain. CuNPs-injected rats showed also decreased exploratory behaviour. The results obtained in the present study point to the importance of toxicity assessments in evaluating the efficiency of CuNPs for the safe implementation in different applications.

Keywords: copper nanoparticles, oxidative stress, acetylcholinesterase, X-Ray Diffraction, behavior experiments.
Grape seed derivatives in cancer treatment

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Abstract

In the last decades, there is an increasing concern to new and safe medications to treat cancer which is becoming a widespread problem all over the world. Grape seed extracts proved to have a role in the management of cancer, they enhance the effect of chemo adjuvant treatment or prevent progression. Previous work demonstrated that Grape seed derivatives like procyandine B23,3"-di-o-gallate showed a great effect in the treatment of prostate cancer. Resveratrol, which is considered, as is a type of polyphenols had proved therapeutic potential against colon cancer, in addition, Alpha-linolenic acid showed promising effects in the treatment of skin, breast and esophageal cancers. Moreover, polyphenols demonstrated a success in the treatment of different types of cancer and their effects was dose and time dependent. The present work reviews a number of previous studies that used grape seed or one of its derivatives in the management of cancer.

Keywords: Grape seed derivative; Resveratrol; polyphenols; Alpha linolenic acid; Anticarcinogenic.
HEAVY METALS TOXICITY ON CHILDREN AND INFANTS

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Abstract

Heavy metals are environmental elements with toxic properties for humans and wildlife. Children are more vulnerable to heavy metal toxicity, the exposure can be occur in nature through inhalation or food intake. There are many risks due to this exposure to the children causing diseases depends on the route of exposure and the kind of metal. The aim of this review is to show the effect of heavy metals exposure to children in different cases of exposure and several heavy metals such as Cd, Ni, Cr, As, Se, and Pb and to determine the diseases can happen to infants and newborn and how the heavy metal can transfer from mother to fetus through placenta during pregnancy. Autism is an example of the dangerous diseases result from the highly exposure of heavy metals. Other side effects of heavy metal exposure are birth weight and dermal diseases. the main purpose of this review is to show the connection between the heavy metal and the toxic effect on children. By using a cross sectional studies to show how exposure of heavy metal to mothers plays a very important role on children health, as mother milk can be source of heavy metals to infants as example. This review collected many different studies in many areas with different metals on the last ten years approximately to enable us found all prospective of this important issues.

Keywords Heavy metals toxicity, children, placenta, Cadmium, Mercury, mother-child, pregnancy, fetus, Autism, exposure effects.
In-Vitro Evaluation of Copper Nanoparticles Cytotoxicity And Genotoxicity In Normal and Cancer Lung Cell Lines

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In-vitro evaluation of copper nanoparticles cytotoxicity and genotoxicity in normal and cancer lung cell lines Abstract Nanotoxicology is a major field study that reveals the importance and hazard effects of nanomaterials on the living cells and tissues. In vitro studies on biological cell lines allow more control and observation along the experiment time. In the present study, Copper nanoparticles (Cu NPs) were prepared by chemical reduction method. Then, characterization was done by different physical techniques such as: Dynamic Light Scattering (DLS), X-Ray Diffraction (XRD), Transmission Electron Microscopy (TEM), Scanning Electron Microscopy (SEM), Fourier transform infrared spectroscopy (FTIR) and Energy Dispersive X-ray Spectroscopy (EDS). As the respiration of freshly pure air is a vital process, lung cell lines have been chosen as the scope of this study. Evaluation of the toxicity of Cu NPs was performed on 2 types of cells: the human diploid lung fibroblast normal cell lines (WI-38 cells) and the human epithelial lung carcinoma cell (A549 cells). In order to assess the toxicity of the prepared Cu NPs, the two cell types were exposed to 10 mg/ml serial diluted Cu NPs for 72 hrs. The half-maximal inhibitory concentration IC50 of Cu NPs for both cell types was separately determined and used to examine the cell genotoxicity (Comet assay) concurrently with some oxidative stress parameters such as nitric oxide (NO), glutathione reduced (GSH), hydrogen peroxide (H2O2), malondialdehyde (MDA) and superoxide dismutase (SOD). Physical characterization of Cu NPs revealed that there were spherical in shape with an average size of 19.94 ± 3.80 nm. Cu NPs suppressed the proliferation and viability of normal and carcinoma lung cells. Treatment of both cell types with their IC50's of Cu NPs resulted in DNA damage besides the generation of reactive oxygen species xi (ROS) and consequently a generation of a state of oxidative stress. Overall, it can be concluded that the IC50's of the prepared Cu NPs were cytotoxic and genotoxic to both normal and cancerous lung cells.

Keywords: Copper nanoparticles (Cu NPs), human lung normal cell lines (WI-38 cells), human lung carcinoma cell lines (A549 cells), toxicity, oxidative stress, comet assay, DNA.
Thin Film Applications in Wound Healing

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Abstract

Wound healing becomes more efficient and easier by the aid of thin films. Gelatin production of thin films used for wound dressing is due to its high curative effect, antibacterial and the easy way to form it as a thin film. Many studies were made on bacterial cultures to uncover the role of the gelatin thin films in the wound healing treatment process. Silk/gelatin (S/G) film displays excellent mechanical properties which is essential for wound healing applications which cannot be obtained from sole gelatin film. Collagen is mostly found in fibrous tissues. It is important in tissue engineering and cosmetic medicine. Collagen films which are prepared from Brazilian propolis or chitosan have a good effect in improving wound healing process when it works as wound dressing for dermal burn healing. One of the gel for wound healing purposes is Aloe vera gel which enhances the degree of collagen cross-linking and the synthesis of collagen after topical and systemic administration in wounds created in a diabetic rat model. Aloe vera-Ca-alginate films shows intrinsic properties of wound healing process like the flexibility and high transparency. Chitosan is a cationic natural polymer and a natural polysaccharide that has been used for years in wound healing because of its ability to stimulate healing process, being nontoxic and has biodegradable properties. The properties of chitosan can be developed by incorporating it with substances which have properties that can increase the efficiency of chitosan. These substances are like thyme oil, ECM from porcine omentum and also by using castor oil as matrix material in the production of biocompatible and biodegradable non composite film containing chitosan modified ZnO nanoparticle, curcumin, as gelatin, tourmaline, polyvinyl alcohol/sodium carboxy methyl cellulose, polyvinylpyrrolidone, Poly (vinyl alcohol), Methoxy-poly (ethylene glycol) etc and with others to improve efficiency of chitosan film in wound healing process. After the preparation of the previously mentioned thin films, some tests are carried on to show how these thin films affect wound healing process like characterization of films by FTIR, SEM. Also, for each thin film type, physical properties: like: water vapor permeability, oxygen transmission rate, antimicrobial activity and antioxidant activity are studied. In vivo and Vitro experiments demonstrated that these films showed antibacterial activity, decrease in wound size, low swelling behavior, nontoxicity and tissue repairing etc.

Keywords: Thin film; Wound healing; Gelatin; Silk; Collagen; Chitosan; Aloe vera
Multifunctional Nanoparticles in Stem Cell Therapy for Cellular Treating of Kidney and Liver Disease

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Abstract

Advances in stem cell treatment and nanotechnology have been considered as great promising destination for developing new strategies in regenerative medicine applications such as liver and kidney repairing. From previous studies, this review will focus on stem cells that can be divided into Embryonic stem cell, Adult stem cell, Mesenchymal stem cell MSC, Induced pluripotent stem cell IPS, and their remarkable abilities to regenerate different damaged tissues, also discussing types of nanoparticles such as silver, gold, quantum dots, silica and iron oxide, and their effects on stem cell viability, differentiation, proliferation and cytotoxicity. The aim of overview is elucidating the mechanisms of internalizing nanoparticles in stem cells via providing analysis of the methods used in exploring the migration routes of stem cells and their reciprocity with microenvironment target in the body and tracking the fate of exogenously transplanted stem cells by using non-invasive techniques such as magnetic resonance imaging MRI, multimodality tracking, optical imaging and nuclear medicine imaging, which designed to follow up stem cell migration. However, MRI is greatly used in stem cell tracking and seems to be the most favorable tool for dynamically observation in vivo cell. Labeling of stem cells with nanoparticles overcame the problems in homing and guiding to desired site to be treated. The current understanding of stem cell migration to the site of injury in vivo and in vitro is almost achieved. This article will explain the distinctive strategies that were mentioned in previous researches such as: 1-enhancing homing of labeled stem cells with nanoparticles into damaged hepatic and renal tissues through inducing specific gene into stem cell, various chemokines and applying external magnetic field. 2-How to improve nanoparticles uptake by using transfection agents or covalently binding an exogenous protein or conjugating a receptor-specific monoclonal antibody. 3-Contains stem cell labeling methods as extracellular labeling. Ultimately, our review indicates trails of researchers in nanoparticles utilization in stem cell therapy in both kidney and liver diseases.
Electrical and Mechanical Characterization of Vulcanized natural Rubber Filled with BaTiO$_3$ Ceramic-Filler

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Abstract
Ceramic-rubber composites made of natural rubber (NR) loaded with various concentrations of BaTiO$_3$ particles were prepared by mixing and hot pressing. A silane coupling agent (KH-570) was utilized to modify the BaTiO$_3$ particles surface. The successful attachment of the coupling agent to the BaTiO$_3$ particles was confirmed by FTIR spectroscopy. The influence of surface modified BaTiO$_3$ (SMBT) particles concentration on the morphological, cure, mechanical, and electrical properties of the resulting samples was explored. The elongation at break and the tensile strength decreased with the addition of SMBT particles, while the hardness of composites increased. An enhancement of the dielectric constant ($\epsilon'$) of the composites was observed by incorporation of SMBT particles. The measured $\epsilon'$ of the composites was modeled using the theories of a heterogeneous medium. The dielectric loss showed a clear peak at high frequency, indicating the relaxation process of the orientational polarization.
Spectroscopy Study for the Structure Characterization of Chitosan/Montmorillonitenanocomposite With Different Loads

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Abstract

Chitosan biopolymer and the montmorillonitenanoclay(MMT) are prepared in form of thin films by casting technique with different weight percentage (10, 20, 30, 40, 50, 60, 70 %) of MMT/Chitosan. Sonication method is used to obtain well dispersion as possible of MMT into chitosan. XRD, IR, UV/visible and thermal studies have been used to investigate the structural changes and the thermal stabilities for these high doping samples in order to be applicable for certain applications. The XRD confirms the existence of the interaction between chitosan and MMT and the IR showed the disappearance of some bands and the displacement of amid groups and the changes of intensities of the IR spectra that support the existence of structure changes depending upon the percentage of the load of MMT in Chitosan. The UV visible spectra showed certain absorption bands in the UV ranges at the low percentage of MMT as well as an evidence of the plasmon effect at high loading. The optical parameters such as the absorption edge, optical band energy and the refractive index are estimated for the different samples. The thermal analysis such as DSC and derivative TGA data are used to calculate the thermodynamic parameters through the decomposition processes that provide an evidence of the thermal stability and the complexion between nanoclay and Chitosan.

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Influence of Er$^{3+}$ Ion on the Samarium Environment in Phosphate Glasses


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bPhysics Department, Faculty of science, El-Azhar University, Cairo, Egypt.
cPhysics Department, Faculty of science, Benha University, Egypt.

Abstract
Samarium zinc sodium phosphate glasses doped by different Er$_2$O$_3$ concentrations were prepared using conventional melt quenching technique. The structural properties due to the influence of Er$^{3+}$ ions on the present glass network were investigated. The X-ray diffraction (XRD) patterns confirm the amorphosity of the samples. Surface morphology and elemental composition of glasses were studied using scanning electron microscope (SEM) accompanying with Electron Dispersive spectra (EDX). The measured density, Molar volume, ion concentration, interatomic distance, polaron radius and field strength had been studied with respect to the concentration of Er$^{3+}$. Fourier Transform Infrared Spectroscopy (FTIR) results showed that Q1 and Q2 were the mean structural units of these glasses and revealed the formation of Non-Bridging oxygen (NBO).

Keywords: Rare earth element, phosphate glass, structural properties.
Searching for Nuclear Magic Numbers Close to Two-Protons and Two-Neutrons Drip Lines in Super and Ultra Heavy Regions.

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Abstract:

Recent researches carried out on the magicity of heavy and superheavy nuclei, some of them extend the interest to the ultra heavy regions. Our concern is the magicity of protons and neutrons in super and ultra heavy regions. Using Strutinsky’s approach, and consider the shell correlation, residual pairing correction, two-nucleons separation energies and two-nucleons energy gap for even-even nuclei along Beta stability line and two-neutrons drip lines, over the ranges $70 \geq Z \geq 274$ and $80 \geq N \geq 548$ and $70 \geq Z \geq 212$ and $126 \geq N \geq 548$, respectively. We obtain the protons and neutrons magic numbers in these two regions, the new magic numbers are defined by Green’s formula. The calculations is based on spherical structure of the nuclei considered and present evidences on new spherical magic nuclei in super and ultra heavy regions.
Thin Film Applications in Wound Healing

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Abstract

Wound healing becomes more efficient and easier by the aid of thin films. Gelatin production of thin films used for wound dressing is due to its high curative effect, antibacterial and the easy way to form it as a thin film. Many studies were made on bacterial cultures to uncover the role of the gelatin thin films in the wound healing treatment process. Silk/gelatin (S/G) film displays excellent mechanical properties which is essential for wound healing applications which cannot be obtained from sole gelatin film. Collagen films have a good effect in improving wound healing process. One of the gel for wound healing purposes is Aloe vera gel which enhances the degree of collagen cross-linking and the synthesis of collagen after topical and systemic administration in wounds created in a diabetic rat model. Aloe vera-Ca-alginate films shows intrinsic properties of wound healing process like the flexibility and high transparency. Chitosan has been used for years in wound healing because of its ability to stimulate healing process, being nontoxic and has biodegradable properties. After the preparation of the previously mentioned thin films, some tests are carried on to show how these thin films affect wound healing process like characterization of films by FTIR, SEM. Also, for each thin film type, physical properties: like: water vapour permeability, oxygen transmission rate, antimicrobial activity and antioxidant activity are studied. In vivo and Vitro experiments demonstrated that these films showed antibacterial activity, decrease in wound size, low swelling behavior, nontoxicity and tissue repairing etc.

Keywords: Thin film; Wound healing; Gelatin; Silk; Collagen; Chitosan; Aloe vera
Empirical Study of Solar activity indicators, Halo CME and North Atlantic Oscillations for the 22nd&23rd solar Cycles

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Key words: Solar activity, NAO, Halo CME, sunspots number, sunspots area, NAO

Abstract

Influence of solar variability on the Earth's climate requires studying solar interactions, and mechanisms that explain the response of the Earth's climate system.

The NAO (North Atlantic oscillation) is considered as one of the most dominant modes of global climate variability. Like El Niño, La Niña, and the Southern Oscillation, it is considered as free internal oscillation of the climate system not subjected to external forcing. It is shown, to be linked to energetic Solar eruptions. Surprisingly, it turns out that features of solar activity have been related to El Niño and La Niña, also have a significant impact on the NAO. A substantial portion is associated with the North Atlantic Oscillation (NAO), a hemispheric meridional oscillation as atmospheric mass with centers of action near Iceland and over the subtropical Atlantic.

Sunspots area and coronal mass ejections (CMEs) are from the most important solar events as far as space weather effects are concerned, linking solar eruptions, major interplanetary disturbances, and geomagnetic storms. A halo CME, which is usually associated with activity near the solar disk center, has great influence on space weather because an Earthward halo CME is indicative of coronal mass and magnetic fields moving out toward the Earth, therefore likely to cause geoeffective disturbances.

In this work different statistical tools were implemented to investigate the interrelationships among sun spots area and halo coronal mass ejections (HCMES) with NAO index on the solar cycles 22,23, the results were discussed to show their dependency which consequently can be used to predict the behavior of NAO index in the next solar cycles using as an indicator to climatic variability.
Improving the efficiency of QDSSCs Based on 
\( \text{TiO}_2/\text{CdS} \text{(Silar)}/\text{TBAI capped CdSe (Colloid)} \) 
Photoanodes.

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Abstract:

CdS/CdSe co-sensitized photoelectrode for QD-sensitized solar cell (QDSSCs) has been prepared. CdS is synthesized using successive ionic layer adsorption and reaction (silar), while CdSe has been synthesized by organometallic method. The TOPO and HDA capping of CdSe QDs has been modified to be Tetrabutylammonium iodide (TBAI) in order to decrease the CdSe-TiO\(_2\) molecular separation. The results show that the short current density increased from 2.1 mA/cm\(^2\) for (CdS-Silar) to 3.75 mA/cm\(^2\) for (CdS-Silar/CdSe–TBAI). This increase is due to the higher conduction band (CB) of the CdSe QDs than TiO\(_2\) and CdS (silar). An energy conversion efficiency of 0.92% is achieved by using TiO\(_2\)/CdS/CdSe photoanode.

Keywords:

Quantum dot sensitized solar cell (QDSSCs); Silar method; TBAI; capping exchange.
STUDYING LASER IRRADIATION EFFECTS ON ELECTRICAL PROPERTIES OF ZnO VARISTORS

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Abstract

Three samples of ZnO varistors doped with concentrations of copper oxide of 0.5 mol%, 1 mol%, and 3 mol%, with other impurities like carbon and iron. The traditional methods of preparing samples by mixing, drying, pressing and firing at 1100 °C were used to obtain the samples in the form of dry solid discs. ZnO is a semiconductor ceramic material having a non-linear relationship between current and voltage, this property is used mainly to protect electric circuits from over-voltage risks on important parts of the electrical circuits such as various electronic components. The effects of the AC current frequency from 0 to 100 kHz and temperature from 20 to 170 °C were studied on the dielectric constant, and electrical conductivity and comparisons of these parameters before and after laser irradiation are concluded. It was clear from the results that the carbon element which exists in all samples with different concentrations with the highest concentration in sample (2) has a big effect on the conductivity, the electrical conductivity of sample (2) highly increased than those of samples (1) and (3), while the iron component as an electrically conductive element is found by EDX only in sample (3) and in a very small concentration, and its effect on the electrical properties of this sample is thought to be negligible with respect to the effect of its high carbon content.

Keywords:
Nd:YAG laser, ZnO, EDX, SEM, XRD, AFM
Multi-Space Observations of Magnetic Field Variations Using Satellite Data

By

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Abstract

Sun is a source of heating, light and releases massive amounts of ionized particles (plasma) in all directions of interplanetary (IP) space; it causes an active source for geomagnetic activities, which in turn affects the navigation systems. A class of these activities happened sudden variation in the global magnetic field namely, geomagnetic sudden commencement (SC) and can be detected by magnetometers on the ground and in space.

The current study concerns with the SC measurements obtained from a number of satellites distributed around the earth to have a global feature of the magnetic field at different local times and different altitudes.

Keywords: Plasma; Magnetic field; Sudden commencement
Abstract
Assuming the existence of an Atomic Fabric makes up the sub-atomic world consists of a mixture of fields, weak nuclear force, strong nuclear force and electromagnetic force.
Where the nucleus represents the center of curvature in this fabric which makes electrons move according to the gravity of the nucleus, and the movement of the electrons create waves in the fabric which in turn creates radiation, and there maybe exist a weak radiation results from these waves which makes it undetectable or maybe it lies outside of the electromagnetic radiation range or it creates particles that we didn’t observe yet.
There are two experiments supporting the above assumption:
First, when placing an atomic clock (Cesium clock)on an airplane and placing a seconadtomeric clock on the ground, when the aircraft take off for a flight and return to ground, a delay I time was observed on the first clock relative to the second one which proved time delay according to special theory of relativity.
Regarding the time that an atomic clock express, it represents the time of radioactive decay which changes depending on the mass of the nucleus such that it takes longer time for heavier nucleus, in other words, a delay in time. As the special relativity says, a moving particle acquires excess mass and that what happened for the nucleus in the atomic clock and made a delay in time due to excess in mass which creates stronger curvature in the atomic fabric and changed the waves in it which in turn affected the resulting radiation, here we find that the atomic fabric is affected by speed similar to the cosmic fabric which is affected by bodies’ velocity, so its clear that there is a connection and relation between the two fabrics.
Second: Quantum Entanglement, when reversing the rotation of a particle, there is another particle that reverses its rotation to preserve "Conservation of spin". Thinking of the two previously mentioned fabrics, the atomic fabric in which the first particlelies in transmits information through the cosmic fabric to the atomic fabric of the other particle. So, there is a connection between the two fabrics and it is also evident that other dimensions are approaching them from each other, shortening the distance traveled by the information of the first particleto the other particle.
Here, after two demonstrations, the first was observed in the macroscopic world and the second in the microscopic world.
The point where the two fabrics meet in spatial dimensions is "Singularity" point where the two fabrics have their maximum possible curve, but they are connected in the non-spatial dimensions, which is obvious from the two previous experiments.
If the small particle lies in the atomic fabric and It is also the cornerstone of this universe, so, the atomic fabric is the basic component of the cosmic fabric, that is, the foundation stone of this fabric, and from here we can explain why gravity is the weakest force in the universe.
According to the atomic fabric hypothesis, I think that when we measured gravity, we measured it in the atomic fabric, i.e., in local fabric dominated by
electromagnetism and nuclear forces and when measuring gravity in the cosmic fabric, gravity will appear to be the strongest. According to these hypotheses, we can also explain why there is a magnetic field in the universe from the ground up.

Returning to the point of singularity that the big bang theory tells us about, there was the substance of the universe clustered at one point with a very high density, and according to my previous assumptions, this point contained inside it the atomic fabric, and at the time of the explosion, the particles came out and with its fabrics which united forming the cosmic fabric. But, where the magnetic field comes from and why its effect is noticeable in the universe? the answer to this question is through my study of evolution of the stars which states that:

when stars consume the nuclear fuel, this reduces the pressure resulting from the process of nuclear fusion in the nucleus of the star, which makes gravity overcomes the internal pressure and makes the star shrink on itself until it reaches a certain level that gravity cannot compress the star more due to the internal pressure of electrons which resists compression.

But in massive stars, gravity compresses the electrons inside the nucleus forcing it to react according to this equation

\[ e + P \rightarrow n + \text{neutrino} \]

The result of this process is a neutron, which in turn will create a neutron pressure that prevents the star from compressing more and a neutron star is born with strong magnetic field.

But in the case of very massive stars, I think that gravity will overcome the pressure of neutrons and press the neutrons making it interact with each other, which will produce a huge energy and another particle. This particle is the generator of the magnetic field in the universe, so it is like monopole, that acts like higgs boson - which makes matter having its mass- as it makes matter having its magnetic property, But when pressed more by the attraction with another particle like it, produces a particle that produces the magnetic field of the universe. So, a particle is responsible for the magnetic field in the universe that may be resulted from fusion of neutrons or other particles undetected yet.

This particle can be existed inside the black hole near to the singularity point where neutrons can be compressed or any other undetected particles to be compressed. Comparing this state with the early state of the universe, the assemblage of the matter of the universe in the first singularity point of the universe requires the existence of this particle there which originated the magnetic field at the moment of big bang.

Finally we conclude that; we can find an answer to the abundance of matter to anti-matter, by reconsidering the positron (anti-electron) detection experiment, after exposing a screen to gamma rays in existence of a magnetic field, it was noticed that both electron and positron were emitted each having an opposite direction of motion (having mirror image) and symmetry.

Thus, by connecting all of the aforementioned facts and conclusions, the mere occurrence of the Big Bang implies the gain of a huge amount of energy to the pressurized matter inside the singularity; perhaps even much more than the Gamma Radiation's, or a new type of radiation that is not yet discovered. Moreover, the particle, that produces an electromagnetic radiation, had already done that then, and we have seen it in the laboratory. However, on the large scale of the universe,
matter went out in one direction with the antimatter going out in the other symmetrical one. That suggests that there might be other sides of the universe since the departure of particles, be it matter or antimatter, in a disordered way where entropy was increasing, and the particles tended more to disorder than order. Yet, the other sides of the universe, including the one we are already in, rotate around a singularity point or at rest! And what makes it hold up to that point up till now? If we are to answer this by assuming that this point is the attraction point for this universe, then in what fabric does it make its curvature? Again, if we are to answer this by the fabric of the universe, however, the fabric of the universe in itself was produced from the atomic fabric that was contained inside it.

This means, through personal conclusion as before, that there exists something that encompasses that point, perhaps a third fabric that we do not know a thing about yet. However, it will open up a whole new and deeper perspective of the gravity than the one the General Relativity had brought up which did not explain why does the universal fabric curve (or deform) under the existence of mass. Also, at the detection of the last gravitational waves, it was found that it was received just at the same time the corresponding electromagnetic wave was received. That implies that they both propagate at the same speed, and that makes us wonder whether they both are special cases of a broader form of radiation of which they are both just a part of.

The dark matter is the more fundamental matter and it consists of very small particles which fuses together to form the ordinary matter. I concluded this from studying quasars and it’s evolution.
Some Physical Properties of SBR/NBR Rubber Blends


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Abstract
Different blends of SBR/NBR compatibilized by butadiene rubber (BR) were prepared according to the well-known standard methods. The modified blend of unfilled SBR/NBR was characterized on the basis of the effect of blend ratio on curing parameters. The mechanical properties, abrasion resistance, compression set and swelling properties of blends were investigated. It was found that SBR/NBR blends showed comparatively better mechanical properties compared to each other individually rubber system. Curing parameters e.g. low torque (ML) was increased, while a reduction in cure time was observed with increasing SBR ratio in blends. Results revealed that increasing SBR results in an enhancement of tensile strength (TS) and elongation at break (E₅). The effect of blend ratio on the swelling and compression set behavior of SBR/NBR compounds was also investigated. From the current investigation it was found that, the increase SBR loading inherent with dramatically decline in swelling percentage while the compression set increases with increasing NBR content. Overall, an observed enhancement in curing parameters and mechanical properties has been achieved by studying the effect of blend ratio on the unfilled SBR/NBR blends.

Keywords
Compatibilizer, SBR/NBR blends, mechanical properties, abrasion resistance, compression set.
EFFECT OF COLD PLASMA ON THE CHARACTERISTICS OF DPPC LIPOSOMES

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Abstract

Cold atmospheric plasma (CAP) has many promising applications in biomedical engineering, dentistry and oncology. This study investigates the effect of CAP on 1,2-dipalmitoyl-sn-glycero-3-phosphocholine (DPPC) liposomes prepared by the thin film hydration method which are used as a model for lipid bilayer membrane. DPPC liposomes were exposed to cold plasma 2, 3 and 5 minutes. The effects of cold plasma on DPPC characterization parameters such as size, charge, FTIR absorption spectrum, UV-visible spectrum and phase transition temperatures were investigated. Exposure of DPPC liposomes to CAP led to an increment in the size and stability of liposomes by increasing the exposure time. 2-min CAP exposure was found to increase liposomal size through particle aggregation, whereas, 3 and 5 min exposure increases the liposome size via adsorption of negative species emerging from CAP on their surfaces. As depicted from differential scanning calorimetry (DSC) results, the electrostatic interaction between the CAP species and phospholipids acyl groups of DPPC resulted in the change of DPPC conformation. The hydrocarbon chains of lipid molecules arranged more closer, especially with increasing the exposure time. Thus, it can be concluded that CAP alters the physical and chemical characteristics of DPPC liposomes.

Keywords: Cold plasma, DPPC liposomes, Zeta potential, phase transition, liposome size.
Enhanced Electrocatalytic Oxidation of Formic Acid at Iron and Nickel Oxides Nanoparticles-Modified Platinum Surfaces

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ABSTRACT
Electrocatalytic oxidation of small organic molecules has recently gained more attention because of its application in power conversion technologies. The formic acid electro-oxidation (FAO); the principal anodic reaction in the direct formic acid fuel cells (DFAFCs), is usually catalyzed on either Pt or Pd-based surfaces. Generally, Pd-based catalysts exhibit much higher catalytic activity toward FAO and less intermediates' poisoning than Pt-based catalysts but are, unfortunately, subjected to acute deactivation; making them unsuitable for commercial purposes. On the other hand, Pt-based catalysts which have been proven more durable than Pd catalysts (albeit of less catalytic activity) for FAO represent the ideal choice so far for FAO. At Pt-based catalysts, FAO proceeds in a dual-pathway mechanism; the direct (dehydrogenation—desirable—less overpotential) and indirect (dehydration—undesirable—higher overpotential) oxidation avenues [1]. The indirect pathway of FAO involves the catalytic poisoning of the Pt surface with CO intermediate that is produced "non-faradaically" at open circuit potential. This poisoning is the main dilemma deteriorating the performance of DFAFCs as it severely lowers the energy and power densities of the cells. Herein, we propose a new catalyst composed of iron and nickel oxides nanoparticles and prepared by the layer-by-layer electrodeposition technique on Pt surfaces. The deposition sequence of the catalyst’s ingredients is optimized to attain the highest catalytic activity and stability toward FAO. The transition metal oxide nanostructures assisted in mediating the reaction mechanism via speeding the charge transfer and in imparting a geometrical immunity to the Pt surface mitigating the CO poisoning which ultimately improved the catalyst's durability. Various electrochemical and materials characterization techniques including the cyclic voltammetry, chronoamperometry, field-emission scanning electron microscopy (FE-SEM), energy-dispersive X-ray spectroscopy (EDX) and X-ray diffraction (XRD) were all combined to assess the catalytic activity and stability of the catalyst and further to report the catalysts' morphology, composition and structure.
Simulation of Fusion Evaporation of Mn\(^{52}\) By Ultra Intense Laser Fusion of Al\(^{27}\) Targets

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Abstract

Ultra Intense Laser UIL interaction with Al\(^{27}\) target could possibly give rise to a nuclear reaction of the target nuclei with the accelerated target charged ion in the laser field. The residual radioactive nuclei of Mn 52 and Mn 51 could well be due to evaporation of deuterons and tritons from the created compound nucleus according to the nuclear reaction:

\[
\text{Al}^{27}(\text{Al}^{27}, \text{H}^2) \text{Mn}^{52} \text{ and Al}^{27}(\text{Al}^{27} + \text{H}^3) \text{Mn}^{51}
\]

We here will report simulation of compound nucleus formation followed by particle evaporation applying Mont Carlo code PACE-4 to estimate the possible cross-section for forming highly excited compound nucleus Fe\(^{54}\) leading to the final Nuclei Mn\(^{52}\) and Mn\(^{51}\). The results shown in the figure below indicate that the highest cross section of such possible two reactions is peaking at Al\(^{27}\) ions projectile energy \(\approx 60\) MeV (2.222 MeV/A ) and \(70\) MeV ( 2.593 MeV/A ) respectively.

The cross sections for production of the neutron deficient Mn nuclei resulting from the two above mentioned nuclear reactions of Al\(^{27}\) + Al\(^{27}\) are also estimated. The estimated cross-section of Mn\(^{52}\) and Mn\(^{51}\) positron emitters shown in figure indicate maximum values of approximately 30 and 150 mb at the aluminum ion energies mentioned above respectively. The nuclear reactions leading to Mn positron emitters are expected to also provide deuterons and tritons with the same cross-sections. The energies of these particles (H\(^2\) and H\(^3\)) are calculated considering the newest standard Tables of the Nuclear Masses. Possible acceleration of these emitted particles in the laser field is also expected.

The Possibility of a new approach of fusion of the deuterons and tritons without implosion during the confined short laser pulse duration is proposed. In this approach an intense laser field equal or above 100 Peta Watt would be needed. Simulation calculations for the form factors will be reported. The design of the experimental set up to be applied to attain such Fusion energy and overcome probable difficulties will be elaborated.