Talks Summaries

	Monday 10 December 2018
A12	**Keynotes 1**
001	**From Supramolecular to Adaptive Chemistry - Contributions to Nanoscience and Nanotechnology; Jean-Marie Lehn** Supramolecular chemistry is actively exploring systems undergoing self-organization, i.e. systems capable of spontaneously generating well-defined functional supramolecular architectures by self-assembly from their components, on the basis of the molecular information stored in the covalent framework of the components and read out at the supramolecular level through specific interactional algorithms, thus behaving as programmed chemical systems. The implementation of molecular information controlled, "programmed" and functional systems allows the spontaneous but controlled generation of well-defined, functional molecular and supramolecular architectures of nanometric size through self-organization by design . It represents a means of performing programmed engineering and processing of functional nanostructures and offers attractive perspectives to nanoscience and nanotechnology. Supramolecular entities as well as molecules containing reversible bonds are able to undergo a continuous change in constitution by reorganization and exchange of building blocks. This capability allows for self-organisation with selection and defines a Constitutional Dynamic Chemistry (CDC) on both the molecular and supramolecular levels. CDC introduces a paradigm shift with respect to constitutionally static chemistry. It takes advantage of dynamic constitutional diversity to enable variation and selection and thus allow for adaptation leading to the emergence of an adaptive chemistry. These approaches have been implemented over the years in the generation of functional organic and inorganic nanostructures for molecular and supramolecular electronics, spintronics and mechanics
002	**Advanced Drug Delivery: Nano-targeted delivery for Therapeutic and Imaging; Shaker Mousa** Targeted delivery of drug incorporated nanoparticles, through conjugation of tumor-specific cell surface markers, such as tumor-specific antibodies or ligands can not only enhance the efficacy of the anticancer drug but also reduce its unwanted toxicity. Additionally, multifunctional characteristics of the nano-carrier system would allow for simultaneous imaging of tumor mass, targeted drug delivery and monitoring. A summary of recent progress in nanotechnology as it relates specifically to nanoparticles and anticancer drug delivery will be reviewed. Nano Nutraceuticals using combination of various natural products provide a great potential in cancer management. Additionally, various Nanomedicine approaches for the detection and treatment of various types of clots organ

	specific delivery, vascular targeting, improved PK / PD, and vaccine will be briefly discussed. **Learning Objectives:** Highlight the Role of Nanobiotechnology and other enabling technologies in: Targeted Drug Delivery Improved PK and PD Early detection (Imaging) Targeted Delivery of Chemotherapy for optimal efficacy and safety Nano synthesis and assembly of various platforms for Targeted Delivery Nanobiotechnology in shortening the time and risk of Drug Discovery and Development
003	**Internet of Things and Smart Manufacturing, Ali Shakouri** Nanotechnology and advances in electronic and optoelectronic devices have revolutionized computing and communication. The next wave, nano materials, internet of things (IoT), and data analytics can have broader impact in solving societal grand challenges at the nexus of energy, water, and food. A key challenge for many countries is the access to expensive state-of-the-art facilities as well as a high tech ecosystem to enable advances in technology. Developments in software, modeling tools, and apps provide an opportunity to contribute but at the same time, their impact to solve societal grand challenges may be limited. Some novel functional and 3D printing techniques provide a low cost solution to engage a broader population. Some of the opportunities and challenges related to IoT, data analytics, and distributed manufacturing will be described. Examples will be given from a new regional initiative between Purdue and the ten surrounding counties in north central Indiana through Wabash Heartland Innovation Network (WHIN). WHIN's goal is develop a high-tech ecosystem in digital agriculture and in next generation manufacturing empowered by IoT.
A13	**Energy production and Storage 1**
011	**Metal sulfides with crystal orientation as high performance anode materials for lithium (sodium) ion batteries; Hailei Zhao , Yongqiang Teng, Zijia Zhang, Zhihong Du** Metal sulfides, as energy storage materials, have received great attention. They usually show a layered structure with metal ion layer sandwiched in two sulfide layers, forming a highly bonded blocks, which are then connected by Van der Waals forces. There are two distinct surface planes, the basal, perpendicular to the c axis, and the edge surface, parallel to the c axis. The weak bond strength and large space between the basal planes make the lithium/sodium ion diffusion be more preferable alone the directions perpendicular to c axis. Therefore, the crystal orientation has a strong impact on the lithium/sodium ion storage reaction kinetics. According to the chemical feature of different planes, with surface inducing growth approaches, we prepared several metal sulfides with exposure planes parallel or closely parallel to c axis, providing plentiful active sites for lithium/sodium ion reaction. The prepared metal sulfides with preferable crystal orientation, such as MoS_2 and SnS_2, show fast electrode reaction kinetics and deliver high

	specific capacity and long-term cycling stability. This work highlights the promise of crystal orientation control for enhancements in the electrochemical performance of a variety of structural anisotropic electrode materials for future high-performance batteries
032	**High Conductive Nano-Fiber Shaped PEDOT:PSS for Efficient Perovskite Solar Cell; Hytham Elbohy, Qiquan Qiao** The novelty of our work is to separate PEDOT and PSS segments into aligned fibrous shapes in PEDOT: PSS using an optimized 5 wt% urea. The urea-tuned PEDOT: PSS was used as an efficient HTM. This new morphology was found to be more efficient regarding charge transport and hence higher device efficiency as well as to reduce the acidic character in the PEDOT: PSS layer for better device stability.
044	**Effect of Synthesis Approach on the Structural and Optical Properties of Hybrid Perovskite Materials for Photovoltaic Application; SA Olaleru, KT Roro, B Mwakikunga, JK kirui, N El-Mahallawy and R Mohammed** Hybrid perovskite solar cells aroused great interest in the field of photovoltaics lately due to easy fabrication process, small band gap, high absorption coefficients and carrier mobility[1-3]. In this work, we studied the effect of one- and two-step process on structural, morphological, thermal and optical properties of the perovskite materials for the application in photovoltaic cells. The perovskite materials for inclusion into solar cells were prepared by one- and two-step solution process to generate polycrystalline structures with diverse grain sizes. The dynamics of the formation of perovskite were monitored by UV-vis spectroscopy, scanning electron microscopy, x-ray diffraction spectroscopy and Thermogravimetric analysis. All samples showed an onset of absorption at 850 nm in good agreement with the band gap value (~1.55 eV) of the perovskite materials. The materials in all samples showed a high absorption coefficient, which means that light will be sufficiently absorbed. The samples prepared with two solution process resulted in better XRD patterns. The one-solution sample showed the highest temperature (~800^0C) of decomposition when compared to the two-solution samples at an average of (~350^0C). The uniformity and crystalline nature with large grain sizes was observed in all the samples which is required for high performance PV devices.
104	**Fabrication of Silicon Nanowires by Metal-Assisted Wet Chemical Etching; Aliaa M. S. Salem, Farid A. Harraz, S. M. El-Sheikh** Silicon nanostructures in general and porous silicon in particular are promising materials that have been continuously exploited in various technological applications. This work presents preliminary results on the successful fabrication of silicon nanowires (SiNWs) and other Si nanostructures by a simple, low-cost and versatile metal-assisted wet chemical etching technique starting from Ag nanoparticles or thin film deposited on Si substrates. The influences of the oxidizing agent (the etchant solution), temperature, etching time, and intrinsic properties of the silicon

	substrate (e.g., orientation, and crystallinity) are investigated. The as-produced Si nanostructures are characterized by a variety of techniques including FESEM, XRD, XPS, UV, and PL
B13	**Electronic and Magnetic Applications 1**
109	**Behavior of Magnetic Particles in a Closed Loop System; Myoungwoo Lee, Youn-Jea Kim** In this work, we have studied a closed loop system that can improve the heat transfer efficiency by circulating the working fluid using the characteristics of the magnetic fluid without using the pump. In Particular, when the magnetic field is applied, the behavior of the magnetic particles in a closed loop system is numerically analyzed. Also, the effect of magnetic field strength on the heat transfer effect was analyzed considering various channel shapes and flow conditions.
126	**Hybrid Reinforcement of Aluminum Matrix Composite by Nano Nickel and SiC particles For Electronic Applications; Shimaa A. Abolkassem, Omayma A. Elkady, Ayman H. Elsayed, Walaa A. Hussein** The AL/Ni-SiC composite was prepared via powder metallurgy technique. The Al matrix was reinforced with Ni/SiC composite powder. SiC particles were coated with 10 wt % nickel by electroless Ni deposition process. Different concentrations of Ni–SiC composite powder (5, 10 and 15 wt%) were mixed with Al powder for 5 hr by 10:1 ball to powder ratio, then the mixed powders were compacted at 850 MPa. All samples were sintered in a vacuum furnace at 600˚C for 1 hr. Microstructure and phase composition were estimated by both SEM and XRD. The results showed the homogenous distribution of Ni-SiC all over Al matrix. XRD indicated the presence of Al, Ni, SiC & Ni_3Al intermetallic. The density was increased by increasing Ni-SiC percent. Coefficient of thermal expansion (CTE) was estimated, which decreased by increasing Ni-SiC content. Hardness was improved gradually up to 15 wt %
065	**Nano-Graphene Oxide; Current Trends and Future Advances; Evans Egwim, Alfred Kalu, Emeka Onwurah** Nano-Graphene oxide has generated huge research interests globally over the last two decades. Its structural dynamism and unique chemical properties indicate that beyond its well established biomedical and electronic applications it could play a key role in designing novel products. This paper reviews general applications of graphene oxide, specifically focusing on its role in development of nanocomposite materials and enzyme immobilization; highlighting current approaches, major challenges as well as future perspectives. It proposes potential applications in addressing the property deficiencies associated with biodegradable packaging materials and the inefficiencies limiting biodiesel production systems. The paper also overviews our previous research in developing biodegradable packaging materials using various nanomaterials and approaches to biofuel processing as the basis for our current research projects involving the use of

	graphene oxide in designing novel nanocomposite films for food packaging and for enzyme co-immobilization in biodiesel production from underutilized feedstock.
102	**Optimum Radio-Frequency Plasma Sheath Parameters for Nanoscale Profiles Etching; Mohammed Shihab** Low temperature plasma has a great potential for numerous applications in growth and processing of nanomaterials and the fabrication of sub-microelectronics, e.g., carbon nanotubes, nanowires, thin film depositions and anisotropic etching of metallic, semiconductor, and dielectric materials. In this contribution, we focus on utilizing radiofrequency sheaths (2 MHz) to produce an anisotropic etching profile in the nanoscale (5 nm width and 100 nm depth). The ion energy-angular distribution over the substrate controls the etching rate, selectivity, and the etching profile. The ion energy distribution and the ion angular distribution over the substrate and the direct ion heat flux at the bottom of the etching profile are calculated using the Ensemble-in-Spacetime model as a function of the sheath potential, the plasma pressure, the ion flux to the plasma sheath and the electron temperature. Increasing sheath potential, ion flux, and electron temperature provides narrow ion angular distributions and consequently the ion heat flux at the bottom of the profile increases, this allow deeper etching while preserving profile anisotropy. On the contrary, increasing the plasma pressure broads the ion angular distributions, plasma ions hit the side-walls of the profile and cause deformation to the profile anisotropy.
088	**Shape-Controlled Synthesis of Nanostructured Co-Doped ZnO Thin Films and their Magnetic Properties; F.A. Taher, E. Abdeltwab** Through an understanding of the growth mechanism of diluted magnetic semiconductor (DMS) nanostructures, we tried to manipulate the performance of DMS–based devices. Under hydrothermal conditions, self-assembled complex nanostructures (flowers, sheaves, and cactuses) of Co-doped ZnO DMS thin films were selectively grown. Based on detailed scanning electron microscopy, the sensitivity of the grazing incidence X-ray diffraction and transmission electron microscopy, the possible growth mechanism and phase analysis of the Co-doped ZnO nanostructures were proposed. The observation demonstrates that through self-assembly of 1D primary nanoparticles via oriented attachment or twinning coalescence, the transformation to 3D complex nanostructures was controlled. These novel Co-doped ZnO nanostructures exhibited enhanced ferromagnetism that can potentially develop the performance of spintronic devices. Our findings provide a better insight into the underlying growth mechanisms of the ferromagnetic Co-doped ZnO nanostructures.
A14	**Nanomedicine – Synthesis, Assembly and Characterization**
013	**Metallic and bimetallic nanoparticles: Synthesis, microstructure and properties; Matthias Epple**

	Metallic nanoparticles have been used in nanomedicine since decades, due to their easy preparation and the possibility for selective surface functionalization. In particular, noble metals found applications as they are typically biologically inert in the body, i.e. they do not dissolve, and they do not have harmful side-effects. Silver is an exception because its antibacterial effect is due to the release of silver ions. Alloyed nanoparticles give a combination of the properties of the single metals, e.g. antibacterial effects and surface plasmon resonance (SPR). Synthetic concepts for preparation and characterization of such nanoparticles are presented. Bimetallic nanoparticles with different elemental distribution (core-shell or alloy or graded alloy) were analysed by high-resolution transmission electron microscopy, including elemental distribution inside a nanoparticle. Besides such larger nanoparticles (size about 10 nm), recent developments on ultra small gold nanoparticles are highlighted. They are smaller than proteins, and they can be selectively functionalized to address specific surface epitopes of proteins.
093	**Thiolation-Induced Assembly of Gold Nanoparticles onto Glass Substrates; Ahmed Medhat, Dina Salah, Ibrahim Hassan and Amal Kasry** Self-assembly of gold nanoparticles (GNPs) on different types of substrates has attracted a lot of interest recently, due to their interesting optical properties, such as localized surface plasmon resonance, that make them attractive for several applications . In this work, we introduce a new approach to self-assembled GNPs capped with CTAB. A thiol-terminated compound was used for GNPs thiolation. The Spectra of the GNPs in solution, and after self-assembly were measured, showing that the GNPs are assembled on the surface with different ratios without aggregation.
117	**Effect of Particle Shape on the Flowability of Dry Powder Inhalers: Computational Fluid Dynamics Approach; Alaa M. Ali, Ahmed S. Abo Dena, Ibrahim El-Sherbiny** The aim of this work is to find the particle shape that gives the best flowability in the micro scale, to be applied in pulmonary drug delivery to enhance the dose that reaches the deep lung. The project is divided into two parts: the computational part and the experimental verification part. The computational part deals with aerodynamic simulations using COMSOL Multi Physics software and it can be considered a theoretical study on the flow of differently shaped micro particles in air. It was found that the micro triangle with aspect ratio 2:1 has the least drag force in both deep and upper lung; so, it is the best choice for the particle shape for pulmonary drug delivery preparations. The second part is the experimental verification; where particles with different shapes will be fabricated using a technique called "Particle Replication in Non-wettable Template" (PRINT) and their flowability will be tested using "Next Generation Impactor" (NGI) device to verify the results obtained from the computational model herein.

059	**Magnetite Nanoparticles Encapsulation in Poly-Caprolactone Microspheres for Targeted Drug Delivery; Abdelrahman Mahmoud, Islam Khalil, Nesrine El-Gohary, Mohamed Elwi** Superparamagnetic magnetite nanoparticles (MNPs) were fabricated via co-precipitation and coated with oleic acid. An Anti-inflammatory drug (Lornoxicam), along with MNPs, were encapsulated into Poly-Caprolactone microspheres using an oil-in-water emulsion solvent evaporation method. The effect of using different amounts of MNPs and doubling the aqueous phase volume were studied separately in terms of morphology using (SEM) and (TEM), in terms of composition using (EDS), in terms of magnetism using (VSM) and in terms of drug loading and encapsulation efficiency. Nearly spherical MNPs were successfully fabricated and coated with relatively narrow size distribution ranging between 20 – 50 nm. Spherical microspheres with smooth surfaces were obtained with size range 800 – 2000 nm. Increasing MNPs content increased the magnetization without affecting the morphology. Increasing the amount of aqueous phase resulted in a higher encapsulation efficiency of 84.39%. A system of four planar coils was used to magnetically control the movement of the capsules in a medium of ultra-purified water, as a simulation for the targeting process. Different sizes of capsule clusters were tried and all showed magnetically controlled movement, noting that the larger the cluster, the faster the attraction speed.
039	**Layer-by-Layer-Coated Lyotropic Liquid Crystalline Nanoparticles for Active Tumor Targeting of Rapamycin; May Freag, Yosra Elnaggar, Doaa Abdelmonsif, Ossama Abdallah** **Aim:** This work spotlights on fabrication of CD44-tropic, layer-by-layer (LbL) coated, liquid crystalline nanoparticles of rapamycin (Rap-LbL-LCNPs) to enhance its water solubility and enable its anticancer use. **Methods:** Rap-LCNPs were fabricated using hydrotrope method and then coated using LbL self-assembly technique. **Results:** LbL coating strategy successfully reduced monoolein-induced hemolysis and increased LCNPs serum stability. Lyophilized Rap-LbL-LCNPs were successfully sterilized using γ-radiations. In CD44-overexpressed MDA-MB-231 cells, Rap-LbL-LCNPs demonstrated superior cytotoxicity compared with the nontargeted formulation. Rap-LbL-LCNPs showed 3.35-fold increase in bioavailability compared with free drug. Rap-LbL-LCNPs significantly inhibited tumor growth, enhanced animal survival and reduced nephrotoxic and hyperglycemic effects of Rap. **Conclusion:** LbL coating strategy of Rap-LCNPs could serve as a promising approach that facilitates Rap use in cancer therapy
B14	**Water, Food and Environment**
040	**Analysis of the Refraction Index of Colloidal Suspensions in a Fabry-Pérot Optofluidic Cavity; Mahmoud Youcef Mahmoud, Noha Gaber, Frédéric Marty, Elodie Richalot, Tarik Bourouina**

	While it is well-established that Fabry-Pérot cavities can be used to measure refraction index of fluids, little attention has been paid to-date to their use to characterize a colloidal suspension. In this work, the effective refractive index of the medium is first evaluated from measurements of the cavity spectral responses which revealed anomalous behavior. Thorough numerical analysis, we conclude that there are unavoidable systematic errors on the refraction index of such colloidal suspensions, due to the continuous spatial re-distribution of those particles within the sample inside the cavity
068	**Instant Green Preparation of Gold Nanoparticles: Effect of Temperature on Gold Nanoparticles Morphology; Norhan Nady** Synthesis of gold nanoparticles using green reducing and capping agents has been aimed and explored. However, the synthesis process usually carries out for days. In this work, the instant green synthesis of gold nanoparticles using green reducing and capping agents was investigated at two different reaction temperatures (20±3°C and 95±3°C). The instant synthesis of gold nanoparticles preliminarily confirmed by color changing from yellow to dark red or purple in the reaction mixture depends on the reaction temperature. The morphology and size of the synthesized gold nanoparticles were determined by using particle size analyzer, and transmission electron microscopy (TEM). UV–vis spectroscopy was used to track the morphological evolutions and optical properties of the instant formed gold nanoparticles. Prepared gold nanoparticles were characterized by using X-ray diffraction (XRD) and capping of gelatin on gold nanoparticles was confirmed by Fourier transform-infrared spectroscopy (FT-IR). TEM shows the morphology of the synthesized gold nanoparticles with the size range of 8-18 nm at 95±3°C reaction temperature as spherical shape and the gold urchin-shaped gold nanoparticles with 24-100 nm size range at 20±3°C reaction temperature, respectively. This work presents an instant, flexible, and green method for preparation of gold nanoparticles.
105	**Efficient Approaches for Synthesis of Graphene Hybrids for Packaging and Water Treatment; Ahmad Ghanem, Mona Abdel Rehim, Abdelrahman Badwy** Graphene is a one atom-thick monolayer of sp^2-hybridised carbon. Due to its versatile properties, it proved itself in many applications such as energy, sensors, electronic devices, quantum dots and others. However, presence of many functional groups on the surface of graphene (G) or graphene oxide (GO) enables its utilization in novel fields. In this talk, we present modification of G or GO using simple methods for different applications namely, food packaging and water treatment. For the first one, functionalization of GO with polystyrene derivative has been carried out giving nanocomposite with enhanced dispersion in polystyrene matrix. The obtained films showed increase in thermal stability, water vapor barrier properties and higher hydrophobicity. For the second application, doping of G nanosheets with ZnO nanorods (NRs) led to formation of inorganic hybrid suitable for water treatment through photocatalysis. Investigation of the

	hybrids structure using FTIR spectroscopy, TEM and XRD diffraction confirmed hybrids formation and successful doping. Photocatalytic properties of the prepared hybrids, compared with G and GO, have been studied relying on the analysis of chemical oxygen demand (COD). The results confirmed successful demineralization of the synthetic wastewater and it was found that the photocatalytic performance of GO was increased by 30 % while nanocompositing with small ratio of ZnO NRs.
116	**An Attempt to Produce, Precipitate Silver in Nanoparticles, its Effect on Dairy Microbes and Potential Toxicity; Hassan Nour ElDin Hassan, Enas El..Fadly, Ibrahim El-Mehasseb, Mohamed Al-Ghanam El-Magd** We investigated the Ag-NPs antifungal activity against dairy products contaminating fungal strains and studied the Ag-NPs potential toxicity. Ag-NPs were prepared using a reducing reaction in different concentrations. Resulting suspensions had Ag-NPs diameterd 8-11, 25-30, and 48-59 nm on average. Using Zn bars under freezing temperature helped Ag-NPs faster accumulation and more efficiently (2h only) than under room temperature (10d). Ag-NPs had a remarkable anti-fungal activity. Ag-NPs potential cytotoxicity was assessed on the human hepatocyte primary cells using MTT assay and the results indicated a low cytotoxic effect for these nanoparticles. For further safety confirmation of in vivo uses, Ag-NPs was injected in ovo to check their toxicity on the chick embryo. No notable toxic effects were noticed in embryo survival rates, weight, or the histological structures of liver, spleen, and heart. No significant difference in the activities of liver enzymes between Ag-NPs injected and control chicks. The serum levels of malondialdehyde and the total antioxidant capacity exhibited the non-significant difference between the injected and control chicks. Silver in nano-status is a promising choice for the multi-resisting role in the dairy industry.
118	**Application of Chitosan-Citric Acid Nanoparticles for Removal of Selected Metals from Aqueous Wastewater; S.M. Abdelbasir, S. M. El-Sheikh, A.M. Sayed** Chitosan nanoparticles are bio-adsorbents that have been studied for adsorption of metals. To enhance their adsorption capacity, chitosan nanoparticles were modified with citric acid to supplement the functional groups with high affinity for Co (III) ions. In the present study, chitosan-citric (CS–CA) nanoparticles were prepared for forming a new amide linkage, by grafting the amino groups of chitosan in the presence of carboxylic groups of citric acid that acts as cross-linking agent. The as-prepared CS–CA nanoparticle samples were characterized by use of scanning electron microscopy (SEM), Energy dispersive Spectroscopy (EDS), Fourier-transformed infrared spectroscopy (FTIR), X-ray diffraction (XRD) techniques, which showed that the cross-linking agent was preserved during the chemical modifications

129	**Development of Nano-Chitosan Edible Coating for Peach Fruits Cv. Desert Red; Mohamed Momtaz Gad, Osama A. Zagzog and Osama Mohamed Hemeda** Peach is an agriculturally important deciduous fruits of global significance. It is widespread in the newly reclaimed areas in Egypt in the last decade (El-Badawy, 2012). Recently, the production and commercialization of stone fruits especially peaches have increased quickly throughout the world because of its high nutrient level and pleasant flavor. Furthermore, peach fruits are rich with ascorbic acid, carotenoids (pro-vitamin A), phenolic compounds and considered a prime source for antioxidants (Byrne, 2001; Tomás-Barberán et al., 2001). Peach [Prunus persica (L.) Bastch.] "cv. Desert Red " is an early ripening cultivar under the Egyptian conditions. The aim of the present study is to investigate the effect of chitosan nanoparticles coating on the storage life and quality of peach fruits.
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A21	**Nano Pharmaceuticals and Nutraceuticals**
084	**Functioning Anticancer Nanomachine Designed from Nucleotide Aptamer and Light-Powered Nanoconverter; Alexandre Loukanov, Seiichiro Nakabayashi** In this work, the design of anticancer light-powered nanomachine for diagnosis and therapy of malignant breast tumor is reported. It is fabricated from nanoconverter moiety as an energy conversion engine chemically conjugated to photon-fueled oligonucleotide with incorporated aptamer. The nanoconverter is made by non-toxic organic nanoparticles, which contain metal chelate complexes. It converts the near infrared irradiation into reactive oxygen species, which are highly cytotoxic for the breast cancer cells. The photon-fueled oligonucleotide with incorporated aptamer has an improved selectivity to target cancer cells in the tissue. The aptamer was screened by combining of SELEX with freeze-fracture replica labeling method of malignant tumor tissue. The proposed design is active in the breast cancer cells, but remain destroyed by the existing DNase enzymes in their normal counterpart. It opens new ranges of the nanomedicine application in cancer therapy.
058	**Preparation & Evaluation of Pregabaline Based PLGA Nanoparticles as Topical Gel: Targeted Drug Delivery Platform to Treat Fibomyalgia; Mona G. Arafa** The purpose of this study is to synthesize polymeric nanoparticles (PNPs) entrapping Pregabaline (PG) to treat fibromyalgia & lower back pain. Polymeric nanoparticles was characterized in terms of size, polydispersity index (pdi) , charge and entrapment efficiency of PG. X-Ray Diffraction (XRD) and differential scanning calorimetry (DSC) were used to study the crystalline or the amorphous nature of drug before and after being entrapped

	in PNPs in addition to its transition temperature. Transmission and scanning electron microscopes were employed to study the morphology of the PNPs. The controlled release profile of drug based PNPs will be investigated.
149	**Biomedical application of nanofibers, El-Refaie Kenawy**
026	**Alleviation of Cardiac Ischemia by Ajwa Nano-Preparation: Effect on Cardiac Contractility; Soad Al-Jaouni, Seham Abdul-Hady, Hany El-Bassossy, Numan Salah, Magda Hagras** The study evaluated effects of palm dates nano-formulation (Ajwa) on cardiac function and hemodynamic in experimentally-induced angina. Ajwa nano-formulation (13.3mg/kg) was given orally twice daily for 5 days. Angina was induced by vasopressin (3IU/kg; intravenous) and animals were investigated for hemodynamic, biochemical parameters and Immunofluorescence staining of Angiotensin II, Angiotensin II receptor, 4-Hydroxynonenal and collagen protein expression were studied in both groups.. The ball milled date seeds were prepared in nanostructures with sizes in the range of 20-40 nm. These nanostructures have almost spherical shapes with a good size distribution. Administration of the nano-pharmaceutical formulation of Ajwa for 5 days significantly decreases the systolic pressure, diastolic pressure, notch pressure, mean blood pressure and the heart rate compared to the control group. Pre-treatment with 13.3 mg/kg of Ajwa nano-formulation for 5 days lowered the elevated LVEDP compared to the control group. Systolic duration is more in the Ajwa treated group than the control group, in addition heart rate is significantly lower in the Ajwa-treated group than control group. Ajwa group showed a significant lowering of the uric acid. Moreover, Ajwa group showed a significant decrease in the Angiotensin I receptors in both coronary and heart tissues compared to the control group.
B21	**Evaporators and chemical reactors at the microscale**
145	**Non-Equilibrium Effects at the Liquid-Vapor Interface; Alexey Polikarpov, Irina Graur** The non-equilibrium evaporation flow is simulated by applying the non-linear kinetic S-model equation. The profiles of vapor flow, namely temperature, pressure, velocity, and heat flux profiles, are obtained numerically, and the evaporative mass flux is calculated. The expressions for the macroscopic temperature and pressure jumps on the liquid-vapor interface have been revealed with the coefficients being in agreement with elements of the appropriate Onsager matrix of irreversible thermodynamics. The values of the temperature and pressure jumps provided by these relations are compared with the numerical values obtained from the numerical solution of the S-model kinetic equation and good agreement was found. The comparison with recent experiments is carried out and the order of the temperature jumps is found comparable with some of them

134	**A Look on Relevant Nondimensional Numbers for Flow Boiling in Microchannels and Minichannels; Mohamed M. Awad, Zan Wu, Bengt Sundén** In this study, a look on relevant nondimensional numbers for flow boiling in microchannels and minichannels is presented. These nondimensional numbers include Bond number, Froude number, Weber number, Capillary number, Reynolds number, Boiling number, Fang number, Kandlikar first number, Kandlikar second number, Kandlikar third number, and Garimella number (convective confinement number). The literature data plotted in this study were extracted from 25 datasets. Only the stable data points located within the elongated bubbly flow and the annular flow were collected. Flow regime transitions for flow boiling were calculated based on Ong and Thome (2011) and Revellin and Thome (2007). The collected database includes 2573 data points for 15 different working fluids. The water data points from Sumith et al. (2003) (i.e., the only dataset for water) with a diameter of 1.45 mm, show very different behaviors, e.g., with low Fr_{LO} and We_{LO} values, and high Fa, K_1 and K_3 values. The different behaviors of water might be due to its unique properties, such as a high level of surface tension. The advantage of using these maps for flow boiling in microchannels and minichannels is helping the researchers to know the expected range of the nondimensional numbers values at a given hydraulic diameter (d_h) for various working fluids.
099	**Dry Reforming of Methane Over Stable Ni/La-ZrO_2 Catalyst Prepared by Consecutive Impregnations Method; Radwa El-Salamony, Seham Al-Temtamy, Salwa Ghoneim, Dalia Abd El-Hafiza, Mohamed Ebiad, Ahmed El Naggar, Tahani Gendy, Ahmed Al-Sabagh** Nickel supported on zirconia and on lanthana-zirconia prepared by impregnation and consecutive impregnation method respectively were prepared and characterized using SBET, XRD, and HRTEM/EDX. CH_4/CO_2 reforming over the Ni/ZrO_2 catalyst was examined and compared with Ni/La-ZrO_2 catalysts. The Ni/ZrO_2 catalyst showed good texture properties. However, the Ni/La-ZrO_2 catalyst while having lower surface area formed a stable amorphous oxide for the CH_4/CO_2 reforming tests at 800 °C. The H_2/CO ratio reached 1.2 and 1.33 over Ni/ZrO2 and Ni/La-ZrO2 catalysts respectively. The CH_4 and CO_2 conversion% reached 49, 59 and 87, 81 after 210 min of reaction, for Ni/ZrO_2 and Ni/La-ZrO_2 catalysts respectively
063	**K-M Reactor, New Technology for Core Shell Materials; M. A. AbdelKawy, A. El-Shazly** In this study, Nano iron-copper core shell was produced by using K-M Micro Mixer. The reaction between nano pure iron with copper sulphate pentahydrate ($CuSO_4.5H_2O$) beside ethylene diamine tetraacetic acid (EDTA) as stabilizer and ascorbic acid in K-M micro mixer reactor gives many advantages in comparison with traditional chemical method for production of nano iron-Copper core shell in batch reactor. Many factors were investigated for its effect on the process performance such as initial

	concentrations of nano iron, copper sulphate pentahydrate, EDTA and solution flow rate. Different techniques were used for investigation and characterization of the produced nano iron particles such as SEM, XRD, UV-Vis, XPS, TEM and PSD. The produced Nano iron-copper core shell particle using micro mixer showed better characteristics than those produced using batch reactor in different aspects such as homogeneity of the produced particles, particle size distribution and size, as core diameter 10nm particle size were obtained. The results showed that 10 nm core diameter were obtained using Micro mixer as compared to 80 nm core diameter in one fourth the time required by using traditional batch reactor and high thickness of copper shell and good stability.
A22a	**Keynotes 2a**
010	**Graphene-based Materials for Applications in Heterogeneous Catalysis, Water Treatment and Solar Water Desalination; S El Shall** The combination of highest carrier mobility, thermal, chemical and mechanical stability of graphene with its high surface area offers many interesting applications in a wide range of fields including heterogeneous and photocatalysis where metallic and semiconductor nanoparticles can be efficiently dispersed on or within the graphene nanosheets. This talk will address the development of three classes of graphene-based materials as (1) support for metal nanoparticle catalysts in heterogeneous catalysis, (2) sorbent materials for the removal of heavy metal ions from polluted water, and (3) photothermal energy converter materials for efficient solar water desalination. In heterogeneous catalysis, we will discuss the superior catalytic activity of Pd nanoparticles supported on reduced graphene oxide (RGO) nanosheets for carbon-carbon cross-coupling reactions. Second, the enhanced catalytic activity for the Fe-based nanoparticle catalysts supported on graphene in the *Fischer-Tropsch Synthesis* of liquid transportation fuels will be presented. Finally, the superior catalytic activity and selectivity of Pd nanoparticles supported on a sandwich-type nanocomposite consisting of Metal-Organic Frameworks (MOFs) wrapped with thin RGO nanosheets for the biomass-refining of liquids derived from lignocellulosic sources will be presented. For the removal of heavy metals from water, we will discuss the development of chemically modified graphene-based adsorbents containing highly efficient chelating groups such as diamine, imino and thiourea for the effective extraction of the toxic metal ions mercury (II), copper (II), lead(II), chromium (VI), and arsenic (V) from wastewater. For photothermal energy conversion, we will discuss the development of a new generation of highly efficient, flexible, low weight, highly porous and cost effective *Plasmonic Graphene Polyurethane (PGPU)* nanocomposite materials for solar steam generation through the efficient evaporation of water surface pools.

A22b	Keynotes 2b
004	**Impact of Nanobiotechnology on the Future of Medicine: The Road Toward Precision Medicine/Case Studies; S. Mousa** Over the past few years, evidence from the scientific and medical communities has demonstrated that nanobiotechnology and nanomedicine have tremendous potential to profoundly impact numerous aspects of cancer and other disorders in term of early diagnosis and targeted therapy. The utilization of nanotechnology for the development of new nano-carrier systems has the potential to offer improved chemotherapeutic delivery through increased solubility and sustained retention. One of the major advantages of this cutting edge technology is its unique multifunctional characteristics. Targeted delivery of drug incorporated nanoparticles, through conjugation of tumor-specific cell surface markers, such as tumor-specific antibodies or ligands, which can enhance the efficacy of the anticancer drug and reduce the side effects. Additionally, multifunctional characteristics of the nano-carrier system would allow for simultaneous imaging of tumor mass, targeted drug delivery and monitoring **(Theranostics)**. A summary of recent progress in nanotechnology as it relates specifically to nanoparticles and anticancer drug delivery will be reviewed. Nano Nutraceuticals using combination of various natural products provide a great potential in diseases prevention. Additionally, various Nanomedicine approaches for the detection and treatment of various types of organ specific delivery, vascular targeting, and vaccine will be briefly discussed.
005	**Green microsystems: Challenges and Opportunities for Sustainable Development and Smart Cities; T Bourouina** 'Sustainable Environment' and 'Smart Cities' are emerging as new directions of research with considerable momentum towards miniaturized instrumentation with potentially a global impact. Besides its multiscale nature, one systemic view of the City consists of a superposition of several networks: drinking water, energy, transportation, lighting, telecommunication, in which sensor networks can be deployed over IoT platforms for a huge variety of applications and related services. This is definitely an opportunity for novel MEMS sensors to be deployed in a large scale, the city scale, and at reasonable cost. In this presentation, we elaborate on Microsystems and Nanoengineering for the study of different facets of Urban Environment and Civil Engineering. Illustrations will be given of co-integrating nanomaterials with MEMS and microfluidics, leading to novel functional devices applied to drinking water, air quality, and other fluidics natural resources, including fundamental study of construction materials.
008	**Molecular tagging as an experimental tool for investigating out of equilibrium properties of gas flows in MEMS; S Collin** The last decades have witnessed a rapid development of fluidic micro-electro-mechanical systems (MEMS) involving gas microflows, which

	require an accurate control for a lot of microsystem applications: micro-heat exchangers, micronozzles for picosats propulsion, fluidic micro-actuators for active control of aerodynamic flows, mass flow and temperature micro-sensors, micropumps and microsystems for mixing or separation for local gas analysis, mass spectrometers, vacuum and dosing valves… The main particularity of gas microflows is the local thermodynamic disequilibrium which appears first at the walls, in the so-called Knudsen layer. It is a consequence of rarefaction resulting from an increase of the Knudsen number, which represents the ratio of the mean free path over a characteristics length of the fluidic microsystem. At a macroscopic level, the thermodynamic disequilibrium observed in the Knudsen layer leads to a velocity slip and a temperature jump at the wall. Rarefaction also allows generating temperature-driven microflows which can be exploited in Knudsen micropumps without any moving element. New experimental tools are required to locally analyze these phenomena and help developing accurate models of velocity slip and temperature jump boundary conditions. The presentation will focus on recent developments for implementing molecular tagging techniques to analyze velocity and temperature fields in gaseous pressure- or temperature-driven microflows. Further steps to access a direct measurement of velocity slip and temperature jump at the wall will be discussed.
A23	**Exhibitors & Poster Session 1**
043	**High Performance Asymmetric Supercapacitors Based on Polyaniline and Vanadium Oxide; Hossam A. Ghaly, Ahmed G. El-Deen and Nageh K. Allam** Asymmetric supercapacitors with high energy density are fabricated using polyaniline/V_2O_5 nano-sphere (NS) composite as a positive electrode and RGO/V_2O_5 (NS) composite as a negative electrode in natural electrolyte. The PANI/ V_2O_5 NS composite exhibited high electrochemical performance due to the large surface area, fast ion and electron transfer and good structure stability. The proposed hybrid electrodes exhibited excellent pseudocapacitive performance which can be attributed to the synergistic effects of highly conductive carbon materials (PANI and graphene) with the highly pseudocapacitive metal oxide (V_2O_5). The fabricated nanomaterials were characterized by X-ray diffraction analysis (XRD), field emission scanning electron microscopy (FE-SEM), transmission electron microscopy (TEM). The electrochemical behaviors were investigated by cyclic voltammetry (CV) test, charge /discharge and Electrochemical impedance spectroscopy. The prepared electrodes has shown high energy density, good power density and excellent specific capacitance with wide operation voltage up to 1.8 V. Furthermore, the asymmetric electrodes present an excellent cyclic stability which can be suitable for supercapacitor applications. This work provides a promising concept for integrating low cost transition metal

	oxide with porous carbon materials in hybrid electrodes as a next-generation supercapacitor to meet the diverse requirements of modern industry developments.
047	**Hybrid Organic/Inorganic Semiconductors: Innovative Materials for Future Applications; Afaf El-Sayed, Fatma Ibraheem, Iman A. Mahdy, Esmat A. Mahmoud** Using a simple chemical method, we have produced an organic/inorganic hybrid semiconducting system, in which phthalocyanines resemble the organic partner and CdS quantum dots (QDs) resemble the inorganic ones. The systems were inherently investigated with a variety of techniques such as; x-ray photoemission spectroscopy (XPS), x-ray diffraction (XRD), uv-visible optical absorption spectroscopy.
053	**Plasmonic Coated Silicon Nanoparticles for Optical Applications; E. Girgis, C. Tharwat, and Mohamed A. Swillam** Silicon nanoparticles (SiNP) can be used as carriers to realize other optical functionalities to the hybrid thin films. High implementation functional coatings, based on hybrid silicon/polymer matrix materials, are being developed recently to combine the polymer properties such as ease of processing and flexibility with the mechanical properties and versatility of silicon nanomaterials. By using polymer-coated Silicon nanoparticles, it is possible to reduce particle aggregation in the thin films and, thus, achieve more homogeneous distributions of the nanoparticles and, therefore, better material properties. Beside the above issues, the suppressing of light reflection from a flat surface has been an important technological problem for the last decades. The methods of canceling reflection depend on profit different optical elements starting from a simple quarter-wavelength dielectric layer, to nanostructured surfaces for light trapping, graded-index layer. Recently plasmonic silicon nanoparticles have been shown to possess a lot of advantages, most of which are related to excitation of the intense localized surface plasmon resonance (LSPR) in metallic nanostructures and strong suppression of light reflection in wavelength region close to the resonance.
054	**Laser Reduction of Graphene Oxide Thin Film for Optoelectronics Applications; C. Tharwat, and Mohamed A. Swillam** Laser scribed reduced graphene (LSRG) is shown to be successfully produced and selectively patterned from the direct laser irradiation of graphite oxide films under ambient conditions. In addition, by varying the laser's intensity, power, and irradiation treatments, the electrical properties of LSRG can be accurately attune over five orders of magnitude of conductivity. Feature has proven to be difficult with other methods. Our technique has several important advantages compared to other reduction techniques to allow scalable processing, such as selective and flexible processing, high speed, direct writing without catalyst, environment-friendly, non-contact operation, low cost without expensive pico or femtosecond laser

	systems, and can be performed at room temperature in ambient atmosphere without affecting the integrity of either the physical properties or the lattice of graphene.
057	**Quantum Confinement of Cd, Sn Chalcogen Thin Film as Absorber Layer of Visible and Infrared Light; Iman A. Mahdy, Manal A. Mahdy and Esmat A. Mahmoud** Using Inert gas condensation with conventional resistive heating technique we have fabricate a nano-scale thin films from CdTe and CdSe from II-IV, and SnTe from IV-VI semiconductor group. Nanocrystalline thin films investigated using grazing incident in-plain x-ray diffraction (GIIXD), high resolution electron microscope, HRTEM, scanning electron microscope (SEM), Energy dispersive x-ray microanalysis (EDX), uv/visible optical spectrophotometry, and temperature dependent d.c. conductivity.
060	**Silicon Super Absorber in the Mid Infrared Range; Sara Magdi, Farah El-Diwany, Mohamed Swillam** In this work, absorption enhancement in the mid infrared range using silicon nanostructures is theoretically investigated. Thermal harvesting has become tremendously needed with the increasing threat of pollution and global warming. Herein, we study structures with very high absorption in the mid-infrared range consisting only of silicon. The first structure contains doped silicon nanoparticles embedded in thin film intrinsic silicon layer, and the second structure consists of doped silicon nanowires coated with silicon. The effect of changing the nanostructures' diameters, spacing and nanowires length and coating thickness is systematically examined. High broadband absorption in the mid-infrared (from 6 to 14 μm) is achieved for both structures at multiple dimensions with an absorption reaching more than 90% efficiency. Given that the proposed structures could be integrated for on-chip applications due to their small size and CMOS compatibility in addition to the tunability of their high absorption peak, it is believed that this non-metallic super absorber opens up new directions for enhancing light-matter interaction in the mid-infrared range using an all-silicon structure.
072	**Nanofluid from the Womb of Nanotechnology: Challenges and Opportunity in Energy Saving: A Review; Mahmoud Ahmed** Energy represents a vital role in our life. In the other side, the fast progress in technology requires more energy to fulfill its requirements. It is known that the fossil fuel up to a recent time was considered a basic resource for energy. But it is limited and is going to be diminished by time and would also pollute the environment. It became a challenge for scientists to find a solution and alternatives to fossil fuels. Certainly, renewable energy, especially solar energy, can be considered as one alternative to the fossil fuel. However, the nanotechnology revolution jumped to the light to take an important role in various applications in the engineering fields to be replaced as a second good solution in energy. Nanofluids originated from the womb of nanotechnology as a working fluid to be replaced with conventional fluids like water, oil and

	refrigerants. Nanoparticles of relatively high thermal conductivity such as alumina are added to the conventional fluid (base fluid) to form what is called nanofluid which has an improved heat transfer characteristics. A significant saving in energy consumption could be obtained for the performance of the energy systems through the introduction of nanofluids. The present review focusses on challenges and opportunities in energy saving through using nanofluids
079	**New and Advanced Polymeric Systems: A Dielectric Investigations; Gamal Turky, Mona Abdel Rehim, Shereen Shabaan, Mohammed Moussa, Ahmed Ghoneim** Broadband Dielectric Spectroscopy (BDS) is employed to study the dielectric properties of many advanced materials. The produced dielectric spectra occur in a broad range of frequencies that originate from many molecular and sub-molecular dynamics such as re-orientational motions of molecular dipoles, interfacial and/or electrode polarization and electrical conduction arising from the translational motions of ions and electrons. BDS has now taken its rightful place alongside other modern investigative techniques for studying the structure and molecular dynamics of materials. In that manner, we will discuss here the different processes that take place in some synthesized advanced polymeric materials such as hyperbranched polymers, photochromic polymeric systems polymeric liquid crystals, and how they could be applied in different fields
082	**Dielectric Study of the Double Layer in Ionic Liquid; Gamal Turky, Mohamed El-Nasharty, Mona Abdel Rehim, Omnia Shehata, Mohammed Moussa** Energy storage is a vital aim for several decades, and a great number of researches were done to optimize energy storage process. Supercapacitors are essential devices in the way of this aim, because of their high power density, excellent pulse charge-discharge property as well as their very long cycle life. In this work, it is aimed to perform dielectric characterization of ionic liquid as novel class of ionic conductors at the interface (i.e. electrical double layer) in order to optimize the electrodes material and their separation distance. It is the goal to lay the scientific foundation for such a development and to shed light on the interfacial polarization at the surface of the electrode. In order to achieve this goal, dielectric measurements in a vast range of frequencies (0.01 Hz – 10 MHz) and temperatures (180 – 403 K) were done in high accuracy with Broadband Dielectric Spectrometer, BDS. These vast ranges enable the researchers to determine the different steps of electrode blocking at the double layer in addition to many processes at molecular and sub-molecular scales.
085	**Effective ZnO Nanofibers Electron Transfer Layer for High-Performance Perovskite Solar Cells; Ahmed Esmail Shalan, Ali Omar Turky, Mohamed M. Rashad and Mikhael Bechelany**

	ZnO nanofibers were synthesized by versatile electrospinning techniques. The synthetic nanofibers were characterized by X-ray diffraction, scanning electron microscopy and photoluminescence. As electron transport electrodes, the synthesized nanofibers enhanced the performance of the perovskite solar cells. This improvement was attributed to the enhanced smoothness and efficiency of the electron transport path. Thus, ZnO nanofibers are potential alternative to nanopowders electrodes in perovskite solar cells.
086	**Spectroscopic and Photostability Properties of Novel Bis-Fluorescein Derivative Composite Semiconductor Quantum Dots; Mahmoud E. M. Sakr, A. M. Abou-Elmagd, Ahmed H. M. Elwahy, Nabel A. Negm, Maram T. H. Abou Kana** New fluorescent probe derived from fluorescein dye was designed and its chemical structure confirmed by spectroscopic techniques. Semiconductor Cadmium Sulfide (CdS QDs), was prepared chemically. The size of CdS QDs was determined by UV/Vis absorption spectroscopy. The effect of different semiconductor quantum dots concentrations on the spectral behavior of 1×10^{-4} M fluorescein dyes has shown that 5% of CdS QDs in complex with fluorescein and 3% in case of new fluorescein derivative probe, were the optimum concentrations. Spontaneous emission enhancement factors were calculated for all samples. The photophysical parameters of [fluorescein dyes : CdS QDs] were investigated. The excitation energy transfer from CdS QDs as an energy donor and fluorescein laser dyes as energy acceptor has been improved the emission efficiency of samples. The energy transfer mechanism and energy transfer parameters were determined including the critical transfer distance (R_0). The fluorescence enhancement efficiencies at different input pumping energies of diode laser (λ=450 nm) were studied. Relatively high efficiency with good photostability of fluorescein dyes in CdS QDs was assessed. Photostability was decreased to 72% and 75%, in case of complex form of fluorescein and its new derivative respectively, of the initial ASE after continuously pumping with 30 mW for 120 min.
090	**Catalytic Conversion of Carbon Dioxide into Hydrocarbons; Ramadan A. Geioushy** Striving for the production of sustainable energy as an alternative to the non-renewable fossil fuels, solar fuels production from the photocatalytic conversion of CO_2 is considered as a promising asset to face both the critically energy shortage and climate change. Recently, it is shown that the presence of defects on the photocatalysts could play a vital role in trapping charge carriers and prompt for a higher photocatalytic activity of CO_2 towards hydrocarbon production. In addition, using a medium like $NaHCO_3$ and NaOH would increase the solubility of CO_2 in the solution and in turn could boost its adsorption on the catalyst's surface and its reduction probability. In this work, we prepared some advanced nanomaterials used for CO_2 conversion into hydrocarbons.

094	**High Performance Antimony-Bismuth-Tin Positive Electrode for Liquid Metal Battery; Wang Zhao, Ping Li, Zhiwei Liu, Donglin He, Kun Han, Hailei Zhao, Xuanhui Qu** Liquid metal battery (LMB) is an attractive chemistry for grid-scale energy storage application. The full-liquid feature reduces significantly the interface resistance between electrode and electrolyte, endowing LMB with attractive kinetics and transport properties. Achieving a high energy density still remains a big challenge. Herein, we report a low melting point antimony-bismuth-tin positive electrode for LMB with high energy density and excellent rate performance for the first time. The electromotive force of Li‖Sb-Bi-Sn system is determined by Li‖Sb and Li‖Bi chemistries. The Sn component plays a bi-functional role in the chemistry, decreasing the melting point of Sb-Bi-Sn alloy and providing rapid lithium diffusion paths for electrode reaction. The stepwise reaction characteristics of Sb and Bi provides a dynamic microstructure change of intermediate compounds during charge/discharge process, allowing the electrolyte to penetrate and contact with positive electrode to enable a fast electrode reaction. A synergetic combination of these advantages enables the reported Sb-Bi-Sn electrode to demonstrate high energy density of about 260 Wh kg^{-1} and excellent rate capability with almost no capacity degradation at different current densities from 200 to 1200 mA cm^{-2}. All these excellent properties demonstrate that Sb-Bi-Sn alloy is an ideal positive electrode of LMB for large-scale applications.
095	**Large-scale Generated 3D N-doped Graphene Framework Coupled with Fe3C@CNT Rings for Ultra-stable Potassium-ion Batteries; Kun Han, Zhiwei Liu, Ping Li, Qiyao Yu, Wei (Alex) Wang, Cheng-Yen Lao, Donglin He, Wang Zhao, Guoquan Suo, Hao Guo, Lei Song, Mingli Qin, Xuanhui Qu** Potassium-ion batteries (KIBs) are an attractive energy storage system for their abundant and low-cost resource. However, the researches on KIBs are still in their early stage and only a few materials have been explored. Here, we designed a three-dimensional (3D) N-doped graphene framework coupled with Fe_3C@carbon nanotube rings (CNT rings) core-shell structures (Fe_3C@C-NGF) by a low-cost and high-throughput chemical blowing strategy. This 3D few-layered graphene framework spatially sustained by the graphitic struts has the ability to maintain its integral structure during cycling. It should be highlighted that the Fe_3C serves as an efficient catalyst in two stages: the formation of CNT rings wrapped around Fe_3C during the synthetic process and the reversible formation/dissolution of solid electrolyte interface (SEI) film during cycling. More importantly, the CNT rings can confine the active Fe_3C during K^+ intercalation/deintercalation to prevent its pulverization and meanwhile increase the electronic conductivity due to the electron transmission in 3D space. Thus, the Fe_3C@C-NGF electrode shows a remarkable cycle performance of 10000 cycles with high capacity retention

	of 155 mAh g^{-1} at 1000 mA g^{-1} and high initial Coulombic efficiency of 73 % in KIBs
122	**Titania Assisted Metal Organic Framework Matrix for Elevated Hydrogen Generation Combined with the Production of Graphene Sheets through Water Splitting Process; Rasha S. Mohamed, Amal A. Alkahlawy, Heba M. Gobara and Ahmed M.A. El-Naggar** In this study, metal organic framework (Cr-MIL-101) and TiO_2 nanoparticles were utilized as two semiconductors for water splitting process. The coupling of both semiconductors in order to improve the photocatalytic reactivity for the hydrogen production in presence of methanol as a hole scavenger under visible light (sunlight) has been performed. The aforementioned semiconductors and the collected samples after water splitting application are characterized by several techniques viz., XRD, N_2 adsorption-desorption, TEM, EDX, Raman spectroscopy and total content of carbon. The results revealed an efficient yield of H_2 production with maximum purity 99.3% with in-situ formation of graphene oxide nanosheets and multiwalled carbon nanotubes coated over the surface of the physically mixed Cr-MIL-101–TiO_2 system. The amount of H_2 gas produced was stored when using Cr-MIL-101 catalyst individually. The obtained data in this work provides a promising candidate materials for pure hydrogen production as a clean fuel acquired from the water splitting process. In addition, the in-situ production of graphene nanosheets and carbon nanotubes is considered as promising advances for the presented process
127	**Crystal, Electronic Structure, Optical and Electrical Studies of New 2D Hybrid Perovskite $[(CH_2)_n(NH_3)2]MX_4$; X= Cl, Br; M= Co, Mn; n= 4-9 Promising for Photovoltaic Applications; Seham K. Abdel-Aal, Ahmed S. Abdel-Rahman, Gudrun Kocher-Oberlehner, Andrei Ionov, Rais Mozhchil** 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, using in particular Diammonium halide perovskite hybrids
130	**Bi-Functional Tailoring of Platinum Surfaces with Earth Abundant Iron Oxide Nanowires for Boosted Formic Acid Electro–Oxidation; Bilquis Ali Al-Qodami, Heba H. Farrag, Sayed Youssef Sayed, Nageh K. Allam, Bahgat E. El-Anadouli, Ahmad M. Mohammad** In this work, direct formic acids fuel cells were studied to improve its performance durability. Iron oxide nanoparticles were added to the electrode to considerable reduce the formation of CO, which would have caused 'poisoning' of the cell, resulting in a degraded performance. Electrochemical measurements confirmed the enhancement

A24	Energy Production and Storage 2
012	**Exploring New Insights and Innovative Applications of Perovskite Materials; Brahim Elouadi** Perovskite crystalline materials will be thoroughly reviewed to better understand its nature and recent progress made. Applications are diverse and concern very large domains of modern technology: i) dielectrics for MLCC technology; ii) actuators, iii) electro-optical modulation; iv) etc. In the present lecture, we will review the structures as well as some key applications of perovskite oxide materials related to their basic non-linear properties: ferroelectricity, piezoelectricity, etc.
097	**CTAB-Co3O4/RGO Composite as an Efficient Electrode Material for Supercapacitor Applications; Soliman El-Hout, Chunlin Chen, Ting Liang and Jian Zhang** Co_3O_4 is a very promising material for supercapacitor with high theoretical specific capacitance. However, its poor cyclability resulting from the faradaic pseudocapacitive characteristics restricts its application. In this study, we employed an efficient strategy by introducing in-situ reduced graphene oxide (RGO) to establish a porous conductive network for electron and ion transporting. A series composites of Co_3O_4 nanowires supported on RGO were successfully synthesized with the assistance of cetyltrimethylammonium bromide (CTAB) by a facile hydrothermal method. The as-prepared composites were investigated by X-ray diffraction (XRD), Raman spectroscopy, X-ray photoelectron spectroscopy (XPS), Nitrogen physisorption, Scanning electron microscopy (SEM) and Transmission electron microscopy (TEM), as well as electrochemical analysis in a three-electrode system. Remarkably, the composite $(CTAB\text{-}Co_3O_4/RGO)_3$ exhibits a maximum specific capacitance of 531 F g^{-1} at a 0.1 A g^{-1} current density accompanying a 64% specific capacitance retention after 2000 cycles at a high current density of 10 A g^{-1}.
100	**Tunable Non-Precious Metal Oxides for Oxygen Reduction and Evolution Reactions; Abdelhamid M. El-Sawy, Steven L. Suib** Developing green sustainable energy became a great challenge for many scientists. In this presentation, we will show our recent discoveries for replacement of precious metals (Ir, Ru, Pt). These precious, expensive and rare metals have several issues regarding the stability during the course of the reaction. We developed metal-free and manganese oxide catalysts that can electrochemically split the water to oxygen. We have characterized these systems with advanced techniques (HR-TEM, STEM, EELS, EXAFS, XANES, etc.). Mechanism of oxygen evolution and reduction reactions was also examined.

115	**Enhanced NIR Absorption in Highly-Doped Black Silicon; Ahmed A. Elsayed, Yasser M. Sabry, Frédéric Marty, Elyes Nefzaoui3, Yitting Yu, Tarik Bourouina, Diaa Khalil** In this work, the absorption of black silicon (BSi) for incident radiation in the near-infrared (NIR) range is compared for BSi samples of different doping concentrations. The rough top surface of BSi helps suppress reflection by acting as a matching layer between the incident medium (air) and the underlaying silicon substrate, however the low absorption of silicon in the NIR range causes most of non-reflected radiation to be transmitted. Hence, highly-doped silicon is used to fabricate BSi samples of enhanced absorption relying on the high free-carriers absorption which is the main absorption mechanism in the NIR range. The highly doped BSi samples (with donor doping of concentration > $2x10^{19}$ cm^{-3}) show enhanced absorption exceeding 0.8 at room temperature while that of lightly doped BSi ranges from 0-0.2 only in the wavelength range 1.3-2.5 μm
B24	**Electronic and Magnetic Applications 2**
073	**Thermal Stability of Ultra-Tough Nanocrystalline Cu-1%Nb; Mohamed A. Abaza, Ronald O. Scattergood and Khaled M. Youssef** Nanocrystalline metals have strengths exceeding those of coarse-grained and even alloyed metals and are expected to have many applications. However, nanocrystalline materials are prone to grain growth at lower temperatures than their conventional counterparts. Here we thermodynamically stabilized the nanostructure of pure Cu with the addition of 1 at.% Nb via segregation of Nb atoms to the grain boundaries at relatively low temperature. Annealing at 1073K led to precipitation of Nb nanoparticles at the grain boundaries that pin the grain boundary mobility and kinetically stabilized the Cu nanostructure. These results could have implications on the development of thermally stabilized nanostructures.
112	**Impact of a Hole Inversion Layer at the $BiVO_4$-In_2O_3 Interface Produced at High Tunable Photocatalytic Effeminacy; Ahmed Helal, Yu Jianqiang, S M El-Sheikh, Alaa I. Eid, S A El-Hakamc, S E Samra** The photocatalytic performance can be boosted by optimizing the morphology, surface texture of the photocatalyst or by compositing with other phases to form p-n or n-n heterojunction. However, more importantly, the built-in electric field created by internal spontaneous polarization might be more effective than the heterojunction formation. The polarization field can drive electrons and holes to transfer along the opposite directions, which is beneficial for the separation of electron-hole pairs and thus photocatalytic performance. Herein, we demonstrate that a hole inversion layer induced by a ferroelectric $BiVO_4$ perovskite at the n-type In_2O_3 interface creates a virtual p-n junction with high photovoltage, which is suitable for water splitting or CO_2 photoreduction.

089	**Face-on Oriented Thermolabile Boc-Isoindigo/Thiophene Small Molecules: From Synthesis to Device Performance; Mohamed Shaker, Byoungwook Park, Seongyu Lee, Cuc Kim Trinh, Wonbin kim, Hong-Joon Lee, Heejoo Kim, Kwanghee Lee and Jae-Suk Lee** New series of protected isoindigo based solution processable donor−acceptor type of small molecules were synthesized. Tert-butoxycarbonyl (t-Boc) substituted isoindigo is used as the acceptor unit and oligothiophene derivatives as the donor units. Thermal decarboxylation of small molecules films at 200 °C eliminated the t-Boc side groups. The cleavage of protecting group formed variety N-H…..O=C hydrogen bonding across the lactam structures of the isoindigo. The H-bonding formation and its impact on optical, thermal, electrochemical and ambipolar behavior were investigated.
051	**Graphene Nanoribbons Growth on Kinked Au(16 14 15); Afaf El-Sayed, Lukas Kormoš, Ignacio Piquero, Zakaria M. Abd El-Fattah, Jens Brede, Jorge Lobo-Checa, Dimas G. de Oteyza, J. Enrique Ortega, and Martina Corso** Graphene Nanoribbons (GNRs) are promising materials for future electronics. Their very small size and tunable electronic structure emphasize their great importance for constructing innovative devices. In order to reach a higher degree of controlling their size and structure-based electronic properties, a huge effort is paid to study them on many different surfaces. In this work, we present our study of an armchair GNR, i.e. 7-AGNR, on an interesting kinked Au (16 14 15) surface, in which we show a higher degree of controlling the GNR length and electronic structure due to GNR-surface interaction.
074	**Controllable Synthesis and Tuning Realization of Barium Strontium Titanate (Ba1-Xsrxtio3) through Solvothermal Technique; Ali Omar Turky, M. M. Rashad, Mikhael Bechelany** Solvothermal method was employed to synthesize BST nanostructure. This technique is based on thermal decomposition of organometallic compound in organic solvent and has been successfully applied for the synthesis of various types of nanosized metal oxide with large surface area, high crystallinity and high thermal stability. The influences of type on shape of the synthesized nanostructures as well as the mechanism were investigated. An interesting correlation between aspect ratio of the BST products and physical properties of the solvent was observed and presented. In this work barium strontium titanate nano rods were synthesized via the solvothermal synthesis using $BaCl_2$,$SrCl_2$, and different sources for Ti ions as precursors in the mixed of solvent ethanol. The products were characterized by XRD, SEM, TEM, U.V.vis spectrophotometer and DC resistivity, barium strontium titanate nano rods with narrow particle size distribution may be attained by this simple solvothermal method and the particle morphology and size of powders are dependent on Sr/(Sr+Ba) mole ratio in reactant. Average particle sizes, morphologies and compositions of all the synthesized samples significantly

	depend on the Ba/Sr molar ratio in the initial reactants. The particle size gradually increases and the morphology ranges from irregular sphere to rods as the strontium proportion increases in the BST
	Wednesday 12 December 2018
A31	**Nano-Imaging/Diagnostics**
014	**Nanomedicine under the Microscope: A Journey in Pictures; Raj Bawa** There is enormous excitement and expectation regarding nanomedicine as it continues to influence the pharmaceutical, device and biotechnology industries. This is especially true in the design, formulation and delivery of therapeutics as well as the fabrication of innovative nanodevices that cleverly integrate biological, information and material sciences. However, nanomedicine is poised at a critical juncture as numerous market forces and drivers are dictating a change in pharma's quest for discovering, developing and delivering novel therapeutics. These include revenue losses due to patent expirations on blockbusters, enhanced regulatory oversight, ANDA challenges from generic manufacturers, relative scarcity of novel NCEs, etc. In the process, these forces are altering the drug landscape and affecting healthcare delivery. Clearly, new ground rules and competitive business strategies are in order in this post-blockbuster era. As a result, pharma and biotech are frequently turning to miniaturization and "Nano" to enhance or supplement aspects of drug target discovery, drug development, device fabrication, combination products, etc. As nanomedicine gains a firmer foothold and progress at various levels continues (technical, legal, regulatory, societal, ethical), there are certain issues that have come to the forefront. With this backdrop, presentation will highlight the salient issues (via color pictures and animations) of the fascinating world of nanomedicine.
033	**Recent Avenues of Nanomaterials in Molecular Imaging; Ahmed Elshahawy** Nanoparticles are playing a progressively more significant role in multimodal and multifunctional molecular imaging. Agents such as Super paramagnetic iron oxide, manganese oxide, gold nanorods and quantum dots possess specific properties such as paramagnetism, superparamagnetism, surface plasmon resonance and photoluminescence respectively. These specific properties make them able for single/multi-modal and single/multi-functional molecular imaging. Nanoparticles generally have sensitivity range and can be detected via imaging instrumentation. The distinctive characteristics of these nanoparticles make them suitable for imaging, therapy, and delivery of drugs. Multifunctional nanoparticles can be produced through either modification of shell or surface or by attaching an affinity ligand to the nanoparticles. They are utilized for targeted imaging by magnetic resonance imaging (MRI), single photon emission computed tomography (SPECT), positron emission tomography (PET), computed tomography (CT), photo acoustic imaging (PAI), two-photon or fluorescent imaging and ultra sound

	etc. Molecular imaging will be more advanced with multimodality and multifunctionality to detect diseases such as cancer, neurodegenerative diseases, cardiac diseases, inflammation, stroke, atherosclerosis and many others in their early stages. The lecture will intend to reveal recent avenues for nanomaterials in multimodal and multifunctional molecular imaging. In addition, it will emphasize on the distinctive characteristics of nanomaterials which makes them, suitable for biomedical imaging in different modalities.
103	**On-Chip Progesterone Hormone Concentration Estimation by an Optimized Optofluidic Micro Resonator; Noha Gaber, Yasser M. Sabry, Frédéric Marty, Noha Mousa, Tarik Bourouina** Progesterone hormone level estimation is important for various biomedical application for women's health. Performing the detection on-chip may enable realizing a point-of-care-testing device that reduces time, effort and cost of detection, beside needing much smaller sample from patients. The on-chip concentration detection is achieved by measuring the refractive index of the solution containing the progesterone. As the refractive index depends on the concentration of the hormone in the solution, its levels can be estimated. The refractometry is done using an optofluidic Fabry–Pérot micro resonator fabricated on silicon substrate. The design of this resonator is optimized for achieving high quality factor. This enables performing the detection at a single wavelength by tracing the change in optical power level instead of the common method of measuring the whole spectrum, which usually needs an expensive and bulky spectrometer.
B31	**Industrial Applications**
029	**Smart Nanotextiles: Brilliant Colors, UV-Protection, Self-Cleaning, Photocatalytic and Antimicrobial Activity; Ahmed Barhoum** The nanotextiles are increasingly based on ongoing innovation and development of higher performance products. Our group has recently achieved multifunctional modification of natural fabrics made from cotton, viscose, silk, and wool using in situ synthesis (i.e. microwave synthesis, UV-reduction, ultrasonic synthesis, plant extract synthesis) of noble metals and metal oxides, and ceramics nanoparticles. Different functions were rendered to fabrics, i.e. brilliant colors, antibacterial and UV-blocking and photocatalytic, and self-cleaning properties. The treated cotton fabrics also show high protecting functions against UV-transmission (reduction of 65%) and Escherichia coli growth (99%). The side-effects of the UV-reduction process are further investigated.
031	**Analytical Characterization of TiO_2 - Based Nanocoatings for the Protection and Preservation of Architectural Calcareous Stone Monuments; Mohammad A. Aldoasri, Sayed M. Ahmed, Mervat H. Khalil, Sawsan S. Darwish, Mahmoud A. Adam, Nadia A.Al-Mouallimi, and Nagib A. Elmarzugi** Historical stone surfaces and architectural heritage especially which located in open areas may undergo unwanted changes due to the exposure to many

	physical and chemical deterioration factors, air pollution, soluble salts, relative humidity ,temperature, and biodeterioration. The encountered problem represent the main causes of decay of the stone building materials. The aim of this study is to evaluate the use of TiO_2 nanoparticles and acrylic polymer, ethylmethacrylate / methylacrylate (70:30) (EMA/MA) as a coating for providing surface protection and self-cleaning for the historic stone materials. The acrylic polymer was synthesized with concentration 3% (w/v). TiO_2 nanoparticles were added during the synthesis of the polymer with concentrations 3%. The prepared nanocomposites have been characterized by transmission electron microscopy (TEM), to show the structure, particle size and properties of obtained nanocomposites. The coating homogeneity and surface morphology of samples before and after treatment was examined by scanning electron microscopy (SEM). The changes of molecular structure occurring in treated samples was studied by FTIR-ATR spectroscopy and colorimetric measurements were performed to evaluate the optical appearance. The displayed results showed that coating with TiO_2 nanoparticles is an innovative method, which improved their resistance to relative humidity and temperature , self-cleaning photo-induced effects are well evident, and no alteration of the original features.
034	**Comparative Studies on the Fabrication of Photonic Crystals via Self-Assembly of Poly(Styrene-Butyl-Acrylate-Acrylic Acid) and Polystyrene Latexes; Esther Ikhuoria, Ikhazuagbe Ifijen, Saju. Pillai** Monodisperse colloidal poly (styrene-butyl-acrylate-acrylic acid) (P(St-BA-AA)) and polystyrene (PS) colloidal suspensions were prepared using emulsion polymerization. TGA analysis of P(St-BA-AA) latex showed 16.74% loss in weight within heating temperature range of 224 ^{0}C and 383 ^{0}C, whereas no weight loss was observed for PS within this temperature range. The P(St-BA-AA) latex had a slightly higher glass transition temperature (Tg) (108^{0}C) compared to the as-synthesized PS microspheres (106^{o}C). TEM analysis revealed a core-shell morphology in P(St-BA-AA) latex particles, as compared to PS particles. The colloidal suspensions were used to fabricate mono and binary-sized photonic crystals via the evaporation induced self-assembly approach. The mono-sized photonic crystal films showed beautiful colors that varied from blue-green-yellow. The colors were controlled by varying the diameter of the microspheres from 195nm-432n m. SEM/AFM analyses showed that the photonic crystal particles readily assembled into an impeccable closely-packed three dimensional ordered hexagonal structure with multiple monolayer arrangement. Also, the smaller sized P(St-BA-AA) particles (195 nm) in the binary crystals arranged themselves in a well ordered manner around the larger sized PS particles (432 nm). The results showed that the modification of PS functional group with butyl-acrylate (BA) and acrylic acid (AA) produced P(St-BA-AA) latex with more improved properties.

101	**Synthesis and Characterization of Silylated Modified Na-MMT Nanoparticles on Melt Blended Polypropylene Support; Alaa Eid, Amr El-Shamy, Radwa Salem, Ossama Abu Al-Enein** This work was to investigate the effect of functionalized montmorillonite on the morphology, mechanical and thermal characteristics of the resulting PP nanocomposites. Sodium montmorillonite was modified with silane coupling agent via silylation reaction to increase the clay's compatibility with polypropylene. The resulting nanofillers were characterized using (XRD), (FTIR), (SEM), (HR-TEM), BET and (TGA). The PP nanocomposite with intercalated structure was successfully fabricated by melt compounding in twin screw extruder of PP with modified clay and strong effect of the interfacial interaction between the polymer and nanofillers. Their microstructure as well as the influence of clay loading on the thermal and mechanical properties of the resulting products were also studied by TGA (TG, DTG, which indicated good thermal stability of PP matrix in Na^+ MMT- nanocomposites). DSC isothermal curves showed an increase in the crystallization temperature along with increasing degree of crystallinity.
A32	**Keynotes 3**
009	**Breath Analysis Using Nano-Particles for Health; B Mwakikunga** Integration of nano-particles into practical devices has been the goal for many years now. This presentation will cover the early beginnings, the hurdles and final success stories. The diabetes breath analyser is one of the outcomes of the Lateral Gate with Inter-Digitated Drain-Source (LaGIDDS) field effect transistor (FET) invention. The LaGIDDS-FET is a simple combination of the lateral gate FET and the inter-digitated drain-source transistors. This combination presents uniqueness of the possibilities of scanning an analyte or stimulus by means of the changing gate voltage (Vgs) (much like the tuning on the radio set) while logging the drain-source current (Ids). Characteristic peaks and humps are observed for each particular analyte. In breath analysis, we scan an ensemble of close to one thousand chemicals each of which present unique Ids-Vgs "spectra". Each gas in breath has its own unique spectrum. This technology has been in development since 2012 when the first invention was disclosed. The filing of the Patent Commission Treaty (PCT) application has a priority date of 29th May 2013 whereas the first technology demonstrator of the Micro-Nano-Chip (LaGIDDS-FET) was granted by CSIR in Feb 2014 at technology readiness level (TRL) of 6. Revisions to PCT were carried in 2015 wherein in the same year a second technology demonstrator was granted by CSIR on the diabetes breath analyser at TRL 7. At the end of 2015, the patent on the LaGIDDS-FET was accepted by PCT to proceed to National Phase whereby applications were geared to be submitted to nine countries viz: USA, Germany, China, India, Finland, Taiwan, Japan, Korea and South Africa. By April 2016, many of these country-applications had been submitted. South Africa granted in 2016 while

	USA were the first international country to grant the patent in June, 2017 and China followed in October 2017. We have re-submitted the Japan Action in May 2018 and are scheduled to re-submit the Taiwan Action in July 2018.
007	**Engineering of nanomaterials and interfaces: design, properties and applications; M Bechelany** The two main reasons why nanomaterials can have different properties are: (i) the increase of relative surface area and (ii) the quantum confinement effects leading to novel optical, electrical and magnetic behaviors. In order to apply these nanomaterials in different fields and to increase the throughput of nanostructured materials and devices for energy, environmental and health applications, an efficient control of the interfaces is needed. Here, we used different synthesis techniques such as atomic layer deposition (ALD),[1] electrospinning, 3D printing and the exfoliation of Graphene and Boron Nitride etc. as the main tools for the creation of controlled nanostructured materials and interfaces in which the geometry can be tuned accurately and the dependence of the physical-chemical properties on the geometric parameters can be studied systematically in order to investigate their performances in energy, environmental and health applications. We will show examples of how these methods can be used to create biofuel cells, [2] single nanopores for sensing, membrane for gas purification, osmotic energy harvesting [3] and water treatment, optical sensors and biosensors [4], and bionanocomposites materials for packaging, drug delivery and tissue engineering [5] in which the performance varies with the nanostructures/interfaces.
006	**Nanomaterials based start-ups within MINATEC® Innovation campus; J-C Guibert** Grenoble history is based on a strong engineering culture around the triple helix higher education, research and industry. At the end of the nineties, Leti institute management was convinced that a new model has to be adopted to face the challenges of nanotechnology and that entering in the nano-era requires an increasingly significant effort in basic research and consecutive development. So, the innovation campus in MIcro and NAnoTEChnologies MINATEC was thought as a place to manage the integration of knowledge based results from academic research in applied research programs. These programs are conducted within public-private partnership and target high TRL in products available daily at an affordable price. Today MINATEC hosts more than 4000 research-oriented staff from masters students to industrial staff of partners, covering 150.000 sqm of building in which 12.000 sqm of clean room dedicated to micro and nanotechnologies. A favourite way to transfer knowledge to industry is via the creation of start-ups. They represent today 30 % of campus revenue. MINATEC campus teams have created more than 50 material-based companies. Within the

	presentation, we will cover multiple examples of these nanomaterials-based start-up.
A33	**Exhibitors & Poster Session 2**
027	**Computer Aided Design of Magnetic Molecularly Imprinted Polymer Nanoparticles for Solid-Phase Extraction and Determination of Levetiracetam in Human Plasma; Olivia A. Attallah, Medhat A. Al-Ghobashy, Ahmed Taha Ayoub, Jack Adam Tuszynski, and Marianne Nebsen** Aanalytical methods should be sensitive, precise, accurate, and specific enough to measure serum drug concentration. Nevertheless, current sample preparation techniques used prior to analysis suffer from many limitations, including matrix interference, intensive sample preparation and/or long run times. In this study, a novel technique was proposed for the synthesis of a molecularly imprinted polymer (MIP) on magnetic Fe_3O_4 nanoparticles (NPs) with uniform core–shell structure. The Fe_3O_4@MIPs NPs were then applied to separate and enrich an antiepileptic drug; Levetiracetam from human plasma. A computational approach was developed to screen the functional monomers and polymerization solvents to provide a suitable design for the synthesized MIP. Different analysis techniques and re-binding experiments were performed to characterize the Fe_3O_4@MIP NPs, as well as to identify optimal conditions for the extraction process. A validated colorimetric assay was also introduced as a comparable method to a validated HPLC assay for the quantitation of levetiracetam in plasma. It is believed that synthesized Fe_3O_4@MIP NPs as sample clean-up technique combined with the proposed assays can be used for effective determination of levetiracetam in plasma
038	**Characterization of Aluminum Schottky Junction Diode Fabricated on Nickel Oxide Thin Film Synthesized Through Sol-Gel Method; Shadrach Akinkuade, Walter Meyer, Jacqueline Nel** Nickel oxide (NiO) thin films were deposited on glass and p-silicon substrates using sol-gel spin coating technique. Structural, optical and electrical characteristics of the films were studied using X-ray diffraction (XRD), scanning electron microscopy (SEM), atomic force microscopy (AFM), UV-vis spectrophotometry and two-point probe current – voltage (I – V) measurements. Effect of annealing on the properties of the film was studied and aluminum Schottky diode was fabricated on nickel oxide in form of Al/NiO/p-Si structure. Current – Voltage characteristics of the Al/NiO Schottky diode were investigated
045	**Non-Invasive Glucose Sensor; Abdelrahman Toraya, Samir Abozyd, Osama Hiekal, Noha Gaber, Sherif Sedky** Many people suffer from diabetes worldwide, and it is one of the endemic diseases in Egypt. In this work, we propose a non-invasive glucose detection tool that could overcome the disadvantages in traditional medical tools and

	glucose sensors. The proposed key elements are not only useful for this device, but they are also efficient for other MEMS applications. The characteristic wavelength for glucose recognition has been identified based on experimental data. Furthermore, a specific design is achieved for an interferometer based on this characteristic wavelength, as well as a novel design for the comb-drive is devised that can provide the required long travelling range. Finally, the whole system of non-invasive glucose sensor is presented.
064	**Modification of the Egyptian Clay by Two Different Organic Surfactants Using High Speed Mixer; Marwa E. Mohamed, Alaa I. Eid, Malak T.Abou El-khair, Gamal R. Saad** Nowadays, clay minerals are used extensively in a wide range of applications as nano additives for polymeric materials. Nevertheless, their hydrophilic characteristics reduce their degree of compatibility with polymeric chains. To overcome this problem, it is necessary to make an organic modification for the clay to render its surface more organophilic prior to the intercalation of the polymeric chains between its layers. In this work the Egyptian natural clay was modified with two different organic modifiers; Hexadecyl trimethyl ammonium bromide and hexadecyl tetrabutyl phosphonium bromide using both the magnetic stirrer and a laboratory high speed mixer at different mixing times .5, 1, 1.5, 2 and 2.5hr. Basal spacing and thermal stability of the modified samples were investigated using X-ray diffraction (XRD) and thermogravimetric analysis respectively. The effect of different mixing times was also investigated by XRD. Scanning electron microscope (SEM) and Transmission electron microscope (TEM) images were used to show both the morphology and the exfoliation of the clay layers. This work is an approach to enhance the economic value of Egyptian natural resources.
066	**Concepts and Future Applications of Biosynthetic Nanoscale Zero-Valent Silver; Amal A. Mekawey, Eman M. A. El-Taher, Doaa S. El-Desouki** Development of nano-devices using biological materials and their use in wide array of applications has recently attracted the attention of biologists towards nano-biotechnology. In this study, the dominant fungal strain was selectively isolated from confectionery wastewater sample. It was subjected to morphological study and confirmed by image analyzer and SEM as Paecilomyces variotii. The concept of silver nanoparticles (AgNPs) synthesis potential of wet cell mass of P. variotii was investigated, by estimation the hydrogen reductase enzyme. Applications of this isolate (culture plain) and its synthesized AgNPs, for removal of phosphorous and Chemical Oxygen Demand (COD) and evaluation for their activity in decolorization of various dyes, as wastewater pollutants, were carried out. They were active for minimizing the phosphorous and COD levels, and decolorizing dyes. The mycosynthesized AgNPs were inexpensive and readily yield nanocrystalline product, so, their testing as a catalytic activator was also carried out. The results indicated that nanoparticles can be aided to convert the chemical pollutants (nitrophenol) and make it harmless. So, the development of highly

	stable AgNPs using P. variotii, may be considered a good potential candidates for the cleanup of the environment.
098	**Studying the Physico-Mechanical and Electrical Properties of Polypropylene/Nano Copper Composites for Electronics and Industrial Applications; Alaa Eid, Omayma El kady, Lamiaa Mohamed, Ashraf Eessaa, Shaimaa Esmail** Polypropylene/ nano-copper composites have been prepared with 0.5, 1, 1.5 and 2.5 wt% nano-copper particles by mixing the nano-copper physically with the polypropylene granules then, extruded by a twin screw extruder. A comprehensive study on these composites is conducted by measuring the material relative permittivity, electrical conductivity, thermal properties and tensile strength. The results showed a significant enhancement of the composite behavior up to 1.5 wt% nano-particles addition. The increases of the nanoparticles up to 1.5 wt% Cu decreases the relative permittivity and slightly increases the electrical conductivity. Finally, the fabricated composites with different nano-copper contents have large implications within different applications especially in the electronics, packaging, and environmental issues.
123	**Structural and Optical Properties of Nanocrystalline Fe Doped BiMnO3 for Solid-State Dye Sensitized Solar Cells (ssDSSCs); D.A. Rayan, M.M. Rashad, A.E. Shalan, E.A. Abdel-Mawla, A.A. Mohamed, S.K. Mohamed** The objective of this work is to produce high efficiency solid state Dye Synthesized Solar Cells. The formation of bismuth manganite $BiMnO_3$ (BMO) nanocrystalline perovskite powders by co precipitation method at different conditions was studied, in addition to the effect of doping with iron at different molar ratios. Absorbance at different wavelengths were obtained
025	**Ajwa Nano-Preparation Prevent Doxorubicin Associated Cardiac Dysfunction; Soad Al-Jaouni, Seham Abdul-Hady, Hany El-Bassossy, Numan Salah, Magda Hagras** This study evaluated the cardioprotective effect of Ajwa (palm dates) Nano-Preparation in doxorubicin induced cardiotoxicity. The nano-preparation containing the Ajwa both fruit and nucleus in a dose of 1.4 g/kg were given to rats one hour before doxorubicin infusion. Cardiac hemodynamics, blood pressure, cardiac contractility and conductivity were recorded before and after 45 min of infusion of doxorubicin (15 mg/kg, slow IV over 45 min). In addition, blood sample and heart tissue samples were collected and snap frozen until biochemical analysis. Rats pre-administered Ajwa Nano-Preparation were protected from the doxorubicin associated systolic and diastolic dysfunction as appear from the significant elevation in the rate of rise in left ventricular pressure (dp/dt max) and (dp/dt min) compared to DOX group. In addition, it prevented the doxorubicin associated ischemia as appear from the significant shortening in QT interval, JT interval and Tpeak Tend interval versus DOX group. No

	effect on atrial conductivity, as evidenced by the non-significant change in the PR interval and P duration. Ajwa pretreatment increased the antioxidant capacity of cardiac tissue, as evidenced by increasing the cardiac content of reduced glutathione compared to untreated doxorubicin group. It has been concluded that Ajwa Nano-Preparation pre-treatment protects against doxorubicin induced cardiotoxicity.
050	**The Sensitivity of Spleen in Rats to Oxidative Stress Induced by Titanium dioxide Nanoparticles: Potential Role of Chitosan; Tamara Shaker Mahmoud, Aqeel Khaleel Ibraheem, Ahmed Morsi Attia** Despite the widespread use of titanium dioxide nanoparticles (TiO_2NP), few studies were conducted on the toxicity of these nanoparticles in biological systems. Chitosan (Cs) is widely distributed in nature as a component of bacterial cell walls and exoskeletons of crustaceans and insects. Chitosan has been reported to possess immunological, antibacterial and wound healing properties. The aim of the current study was to evaluate biochemically whether Cs is protective in TiO_2NP induced spleen damage. Twenty five male Albino rats Sprague–Dawley rats were divided into five groups, as follows: 1) control1 group - oral distilled water was given; 2) Control2 group - rats were treated with saline i.p. 1 ml/kg; 3) Cs group - administered orally at a dose 140.0 mg/kg body weight (b.w)/day; 4) TiO_2NP group – rats treated with TiO_2NP (50 mg/kg/day) b.w., i.p.; 5) Cs-TiO_2NP group – received Cs one hour prior to TiO_2NP with the same dose of group 3 and 4. All treatments 3 times a week for 28 days. High levels ($p < 0.05$) of spleen malondialdehyde (MDA) and H_2O_2 concentration and low antioxidant defenses, catalase (CAT) activity, as well as glutathione (GSH) concentration in Cs, TiO_2NPs and Cs-TiO_2NPs-treated groups compared to control. Conclusion: Chitosan did not reduce the oxidative stress induced by TiO_2NP, thereby showing no protective effect against TiO_2NP induced spleen toxicity.
056	**Oil Core Polymer Shell Nanocapsules for Enhancement of Antidepressant Activity of Trazodone In Vitro and In Vivo; Nahla Elhesaisy, Shady Swidan** Nanocapsules with polymeric shell made from biodegradable polymers are successful drug delivery systems for controlling the release of drugs. To enhance the entrapment of lipophilic drugs, oil can be added forming a lipophilic core in which the drug is more soluble. The aim of the present work is to formulate oil core polymer shell nanocapsules for the enhancement of the antidepressant activity of Trazodone. It also compare between different oils forming suitable core achieving the maximum entrapment for the drug. Nanocapsules are prepared using nanoprecipitation method. The nanocapsules formed were in the nano range, all have negative zeta potential, while the entrapment efficiency in nanocapsules was up to 74.8 ± 0.5% compared to only 55.7± 0.9 % in oil free nanocapsules. Controlled slow release of trazodone was achieved in vitro from all formulae. Antidepressant activity evaluated by forced swim test for the best formula showed that there was significant increase in the efficacy of trazodone in mice injected with

	trazodone nanocapsules compared to group injected with trazodone solution ($P<0.05$). Finally lipid core polymer shell nanocapsules are efficient nanocarriers for the delivery of poorly soluble trazodone both in vitro and in vivo.
091	**Modified Reduced Graphene Oxide Thin Films for Biosensing Applications; Mona Gaber, Shafei Donia and Amal Kasry** Large-scale fabrication of graphene and reduced graphene oxide (rGO) is important for industrial applications. Chemical solution methods offer a low-cost alternative to produce rGO with high yield. In this work, we explore the fabrication methodologies to produce rGO thin films as an alternative method to Chemical Vapor Deposition (CVD) method, which is costly and time consuming. We rely on spin coating technique to deposit rGO layers. By controlling the coating parameters, e.g. rotation speed, solution concentration, and rotation time, we could fabricate single layer of rGO, as confirmed by UV and Raman spectroscopy measurements. We create nanostructures in this produced single layer graphene to modify its optical properties. We are also studying the chemical modifications of these to develop a graphene-based biosensor
125	**Combined Chemotherapy –Gold Nanoparticles Treatment Is More Efficient than Single Modality Treatment Regimen in MCF-7 Breast Cancer Cell Line; SF Morkos, S Moussa, TI Shalaby, E Zaher, M Elnaggar** Breast cancer is a heterogeneous disease that mandate efficient therapeutics, lower drug toxicity, and overcoming drug resistance. Combination therapy was suggested as a future treatment to attain the required efficacy and tolerable side effects.
024	**Waveguides Sensitivity Analysis for Mid-Infrared Gas Sensing; Raghi S. El Shamy, Mohamed Swillam, Diaa Khalil** Rigorous sensitivity analysis using full-vectorial finite difference mode solver have been carried out for suspended and slot waveguides for mid-infrared (MIR) gas sensing. Each structure was studied once as plasmonic waveguide using doped silicon and once as dielectric waveguide using undoped silicon to show how converting the same structure from dielectric to plasmonic will affect its performance as sensor. The dependence of the effective index, sensitivity and mode loss of each waveguide on the different waveguide dimensions was studied. Doped silicon was used instead of metals in plasmonic waveguides to achieve high sensitivity in MIR. Finally, a comparison between the proposed waveguides is provided.
075	**Effective ZnO Nanofibers Electron Transfer Layer for High-Performance Perovskite Solar Cells; Ahmed Esmail Shalan, Ali Omar Turky, Mohamed M. Rashad and Mikhael Bechelany** ZnO nanofibers were synthesized by versatile electrospinning techniques. The synthetic nanofibers were characterized by X-ray diffraction, scanning electron microscopy and photoluminescence. As electron transport electrodes, the synthesized nanofibers enhanced the performance of the

	perovskite solar cells. This improvement was attributed to the enhanced smoothness and efficiency of the electron transport path. Thus, ZnO nanofibers are potential alternative to nanopowder electrodes in perovskite solar cells
087	**Cyclic Voltammetry and Thermodynamic Data Estimated for the Interaction of Bulk and Nano Cadmium Chloride (Ncc) with Isatin Using Glassy Carbon Electrode; Mohamed A. Morsi , Esam A. Gomaa, and Alaa S. Nageeb** Redox behavior for bulk and nano cadmium chloride (Ncc) was studied using cyclic voltammetry in the absence and presence of isatin (Isa.) using carbon glassy electrode (CGE) in 0.1M KCl as electrolytic medium at two different temperatures. All cyclic voltamograms were carried at the selected temperatures in the absence and presence of isatin (Isa.), the redox reactions and reaction mechanism were studied. All cyclic voltammetric and thermodynamic parameters were evaluated and their values were discussed.
131	**Structural and Magnetic Properties of La and Sm Co-Doped W-Type Hexaferrite Nanopowders; Diaa Rayan, Mahmoud Hessien, Mohamed Rashad** In this work, La and Sm ions doped $BaCo_2$-W-Type hexaferrite nanopowders have been synthesized using tartaric precursor technique with different annealing temperatures from 1000 to 1350 ^oC, based on low cost starting materials. As a consequence, the effect of synthesis conditions on the crystal structure, crystallite size, microstructure and magnetic properties was studied. Results have confirmed that well crystalline La and Sm co-doped $BaCo_2$-W-Type hexaferrite phase was formed
132	**Alternating Magnetic Field Induced Drug Permeability in Liposomes Encapsulating Magnetic Nanoparticles; Bassant M. Salah, Nermeen S. El-Din** Formulation of liposomes encapsulating drug and magnetic nanoparticles is a part in integrating pharmaceutical treatment with the introduction of high-frequency magnetic field system. This study investigates the effect of alternating magnetic field on permeability of such smart liposomes. Here an experimental method is developed for the fast release of the liposomes' payload. We designed three groups of liposomes, Group A for plain liposomes, Group B for liposomes loaded with drug, Group C for liposomes loaded with drug and nanoparticles. The three groups were exposed to AMF of frequency 100 KHz and intensity (~5mT) for 30 minutes. Results showed significant difference in the drug release for Group B other than C, while TEM results showed disruption of the lipid bilayer which proves the valuable effect of the AMF on the drug release system in the presence of Magnetic nanoparticles
133	**Invivo Toxicity Assessment of Gold Nanoparticle of Different Shapes in Drosophila Melanogaster; Ola M. El-Borady, Youssef S. Mahmoud, Naglaa M. Ebeed** The objective of this work is to study the toxicity of gold nanoparticles. Studies were conducted on Drosophila Melanogaster to assess toxicity levels for different sizes and shapes of nanoparticles

041	**Hybrid Electrospun Nanofiber Membrane for Oil/Water Separation; Sara M. Moatmed, Ahmed G. El-Deen, M.H. Khedr, S. I. El-dek, and Hak-Yong Kim** With the environmental pollution growing, oil-water separation has attracted much attention in recent years. Membrane technology is the most effective approach to address this issue. On the other hand, the fouling and low flux of the polymeric membrane is still a big challenge. Electro spun nanofibrous membranes with highly porous structures have a great potential in the applications of oil/water separation and oil harvesting. Facile and low-cost method to fabricate superhydrophobic and super oleophilic nanofibrous mats from polystyrene (PS) embedded by magnetite nanoparticles was fabricated by electrospinning. The resulting electro spun fiber surfaces showed enhanced structure with the combination of nano-protrusions and numerous grooves due to the rapid phase separation in electrospinning. The ratio of nanoparticles combined into the fibers revealed to be the main factor which affects the fiber surface morphology and hydrophobicity. The fabricated nanofiber mats were characterized by X-ray diffraction analysis (XRD) and field emission scanning electron microscopy (FE-SEM). The prepared membrane showed excellent superhydrophobicity with higher water contact angle compared to the pure polystyrene (PS) as a blank. After the oil water separation process, the composite membrane revealed high flux and excellent separation efficiency. The proposed nanofiber membrane showed low cost and remarkable cycling stability durable oil/water separation technique.
042	**Reinforcement of Chitosan Using Natural Fillers to Enhance Physical and Mechanical Properties for Active Packaging Applications; Marwa Faisal, Amal Elhussieny, Irene S. Fahim, Nicola M. Everitt** Food packaging is emerging in response to the current health problems resulting from synthetic plastics used in current packaging. Active packaging extend the shelf life of food. Recently, bio based polymers are used as an alternative to non-biodegradable petroleum polymers. Chitosan which is extracted from shrimp shell waste has been used widely in many applications including packaging. Chitosan has the ability of film forming. Our objective is to enhance the mechanical and thermal properties, preserve the biodegradability rate and decrease the moisture content of chitosan. Therefore, adding of fillers such as cotton, nano cotton and egg shells to the chitosan matrix enhances the tensile strength of the biopolymer film. Young's modulus has been shown to increase up to 2753 MPa when adding egg shells as filler to chitosan films. Besides, adding these fillers with different ratios has shown better thermal stability in the thermogravimetric analysis. Using XRD has confirmed the presence of a new phase between the matrix and the fillers, while FTIR, was used to define the interaction between the molecules. SEM images showed the dispersion of fillers in the biopolymers. Moreover, adding different fillers to neat Chitosan showed an improved biodegradation rate.

046	**State-of-the-Art and Perspectives of Water Desalination Based Capacitive Deionization Technology; Ahmed G. El-Deen** Capacitive deionization (CDI) has attracted a great deal of attention due to power saving during the desalination process. Owing to its unique characteristics, graphene-based electrode can be considered an ideal CDI electrode material. Unfortunately, pristine reduced graphene oxide is still far from the anticipated results. To enhance the electroporation capacity characteristics, novel asymmetric charge coated on porous graphene has been successfully fabricated. The morphology, crystal structure and elemental analysis were investigated by scanning electron microscopy (SEM), transmission electron microscopy (TEM) and x ray diffraction (XRD). The electrochemical behavior was studied by cyclic voltammetry (CV). Furthermore, the desalination capacity was evaluated in compact system under various conditions. The fabricated coated porous graphene electrode revealed a remarkable specific capacitance of with several folds compared to pristine reduced graphene oxide. The proposed coating strategy has shown very good recyclability, full regeneration and excellent electrosorption capacity under low external applied voltage.
062	**Catalytic Degradation of Methylene Blue Using Photo-Induced Biosynthesis of Silver Nanoparticles; Sara M. Ezzat, Sara A.Abdel Gaber, Mohamed El Shazly, Amany Thabet and Mahmoud H. Abdel Kader** Water contamination with methylene blue imposes serious health complications. The aim of this study is to use biosynthesized silver nanoparticles(AgNP) for catalytic degradation of methylene blue. Methanolic extract of brachychiton leaves, Brachychiton *rupestris*, was used as a reducing agent for silver nitrate($AgNO_3$). Several parameters were tested such as sun catalysis, extract concentration (0.25-10%), $AgNO_3$ concentration (0.25-10 mM) and reaction time (1-40 min) to identify the optimum synthesis protocol. The synthesis was monitored by UV-Vis spectroscopy. Nanoparticles were characterized using techniques as TEM, zeta potential , FTIR, SAED, DLS and XRD. The nanoparticles were then tested for their catalytic activity. The optimum concentration of $AgNO_3$ was 2 mM , the extract's concentration was 8% and the sun exposure time was 30 minutes. Absorption peak was at 420 nm. TEM showed that the average size was 15 nm with spherical shape. XRD confirmed the reduction of the silver nitrate. 92.476 % degradation of methylene blue was achieved using 3.5 mg AgNP and 1 ml of 100 mM sodium borohydride mixed for 1 hr and tested after 24 hr. An eco-friendly and photo-induced method for synthesis of silver nanoparticles was successfully performed and used in water treatment.
081	**Enhanced Photocatalytic Performance of Nanosized Sn-Substituted ZnO Photocatalysts for Methylene Blue (MB) Degradation; A.N. El-Shazly, M.M. Rashad, E.A. Abdel-Aal, I.A. Ibrahim , M.F.El-Shahat** A series of Sn-substituted ZnO nanopowders with Sn content ranging from 0.05 to 0.2% were successfully synthesized by the co-precipitation method,

	and its performance in the photocatalytic degradation of methylene blue (MB) dye was investigated. TEM and XRD results indicated that the substitution has no effect on the morphology and the crystal form of ZnO. The results showed that ZnO nanopowders with 5% Sn substituted were the most effective in degrading the MB solution under the illumination of ultraviolet (UV) light.
A34	**Biomedical applications of nanotechnology**
015	**Bioactive glass nanoparticles elaboration: Applications in bone biomaterials reconstruction; H H. Oudadesse, S. Najem, B. Lefeuvre, A. Lucas-Girot, P. Pellen** Recently, nanotechnology offers a new strategy to develop novel bioactive materials. Nanosciences are attractive in relation to regenerative medicine and tissue engineering approaches. Nanopartcles with size of 100 to 120nm enhanced the interactions between cells and biomaterial surfaces. The higher specific surface area of nanoscale bioactive glasses allows faster release of ions and accelerates the deposition process of hydroxyapatite. Ternary bioactive glass nanoparticles (BGN) composed by $SiO2 – CaO – P2O5$ were prepared by a novel method based on a quick alkali-mediated sol-gel method, in which the size of the bioactive glasses could be controlled. Particles size distribution of BGN has been determined by using Dynamic Light Scattering (DLS). Obtained results show the size between 20 and 40 nm with an average of 36 nm. These sizes have been increased to 120nm for biomedical applications according to the experimental method. Physicochemical characterization has been conducted by using several complementary techniques. The bioactive character of these BGN biomaterials was confirmed by using in vitro assays. Nanoparticles have been immersed in simulated body fluid (SBF) for different periods. The formation of hydroxyapatite layer was rapidly observed on the surface of BGN. However, in vivo experiments, which are in way, are necessary to for this nano biomaterial to understand the biological and physicochemical mechanisms. Based on these results, this bioactive glass nanoparticles with excellent bioactivity would be a promising biomaterial for bone tissues engineering. BGN will be also coated on metallic prosthesis by using the electrophoresis method and then associated with therapeutic molecules.
144	**Nanofibers Scaffolds and Nanoparticles/Polymer Conjugates for Antibacterial and Drug Delivery Applications – From Lab to The Market; Wael Mamdouh, James Kegere, Nancy ElBaz, Laila Ziko, Rania Siam** s talk will focus on the latest development of converting Nanotechnology research on nanoparticles and nanofibers for breast cancer and disinfectants from the lab into the market
048	**Detection of Breath Acetone Using Gas-Chromatography Mass Spectrometry and Tungsten Oxide Based Sensor as a Potential Replacement of Blood Glucose Reader for Diabetes Mellitus Monitoring; Valentine Saasa, Mervyn Beukes, Thomas Malwela, Bonex Mwakikunga**

	Diabetes mellitus is a metabolic disorder characterised by low or high blood sugar level. Patients with diabetes are required to monitor their blood glucose several times daily. Not only are these tests painful and costly over time, but also unsafe. In this study, we propose an alternative way of monitoring the blood sugar level by measuring the level of acetone in human breath rather than the traditional pricking method. We found high amount of acetone in diabetic as opposed to the non-diabetic patient when using the Gas Chromatography Mass Spectrometry (GC-MS). These results suggest that application of breathalyser in monitoring diabetes mellitus is crucial and safe for point of care which can be applied to metal oxide based semiconductors. Herein we further report the synthesis and characterization of tungsten oxide as a potential metal oxide for detection of breath acetone in monitoring diabetes mellitus
083	**Structural and Morphological Studies of Ni Ferrite Doped with Cr Ions Prepared by Flash Auto Combustion Method; A. M. A. Henaish, O. M. Hemeda, M. I. Abdel-Ati, B. I. Salem & F. S. El-Sbakhy** The spinel Nano-ferrite system $NiCr_xFe_{2-x}O_4$ (where x=0.0, 0.2, 0.4, 0.6, 0.8 and 1.0) have been synthesized by flash auto combustion method and annealed at 400°C for 2hr. X-ray diffraction (XRD) technique was employed to confirm the single phase formation of nickel ferrite. Transmission electron microscopy (TEM) was used to characterize the Microstructure of obtained nanoferrite. All samples were crystallized in a spinel structure with hexagonal symmetry. The (IR) spectra was recorded in the range 200-4000 cm^{-1}. The bands at 601 cm^{-1} (ν_1) and 410 cm^{-1} (ν_2) were assigned to tetrahedral (A site) and octahedral (B site) groups complex. Morphological observation which was determined by scanning electron microscopy (SEM) has shown agglomerated grains with different shapes and sizes which is typical characteristics of magnetic nanoparticles prepared by flash auto combustion method. The values of lattice constant, X-ray density, bulk density, and porosity were calculated. The decrease in the lattice constant was endorsed to the difference in ionic radius of both Fe^{3+} (0.67Å) and Cr^{3+} (0.64Å). The particle size was found in the range of 18-25nm from X-ray and TEM analysis. The porosity has an inverse character with the bulk density. The aim of the present study is focused on the synthesis of Ni ferrite doped with Cr^{3+} ions and the study of its effect on the spinel structure and other crystal parameters
B34	**Micro and Nano-sensors 1**
049	**Surface Enhanced Raman Scattering as a Sensing Technique Using Silicon Nanowires and Plasmonic Nanoparticles; Mohamed Elsayed, Abdelaziz Gouda, Yehea Ismail, Mohamed Swillam** To overcome the classic sensitivity vs selectivity trade-off associated with sensors, signature spectroscopic information can be exploited. Raman spectroscopy is a label-free sensing method that inherently has excellent

	specificity. Sensitivity on the other hand is generally low due to the generally weak Raman signal. Surface enhanced Raman Scattering (SERS) employs localized surface plasmons on metallic nanoparticles to amplify this signal by several orders of magnitude. In this work, SERS substrates were prepared by growing silver nanoparticles using electrodeposition on silicon nanowires that were prepared using metal assisted chemical etching. Experimental results agree with finite difference time domain (FDTD) simulation results. Using pyridine as a probe molecule, quantitative sensing was achieved with pyridine concentration in the range 10^{-6} M to 10^{-9} M, while qualitative sensing was possible down to 10^{-11} M. The enhancement factor was calculated to reach 10^{11}. Spot-to-spot, sample-to-sample, and batch-to-batch variation was studied to ensure repeatability, which had been a long-standing issue of low-cost SERS substrates. In addition, experiments over several days have highlighted the robustness of these SERS substrates. This work bolsters the use of SERS as a low cost sensing method with good sensitivity and specificity for a plethora of applications without compromising on repeatability or robustness.
055	**Silicon-Based Plasmonic Dipole Nanoantenna in Mid-IR; Hosam Mekawey, Yehea Ismail, Mohamed Swillam** Much research was performed on enhancing the localized field in the visible light spectral range through plasmonic-based phenomena using several metallic nanoantenna designs. This work investigates replacing metal with Silicon as the material of choice. Silicon will enable building such nanoantenna using the same standard fabrication techniques employed in the low cost, mass production of modern electronic chips. Using Silicon with sufficient excess carrier concentration, Localized Surface Plasmon Resonance (LSPR) was found in the Mid-IR instead of visible range for a dipole nanoantenna . LSPR caused an enhancement in the localized field inside and in the near field zone. Enhancing the energy field in Mid-IR can be exploited in building thermal energy harvesters which possess the advantage of harvesting thermal energy during day and night in comparison to traditional solar cells that work during the daylight only. Using dipole silicon nanoantenna, the enhancement reached 20 folds. The effect of varying the design parameters of the nanoantenna on the field enhancement was performed. The effect of varying the excess carrier concentrations in Silicon on the realized LSPR enhancement was also studied
076	**Wedge Interferometry: The Doorway for High Sensitivity Miniaturized Opto-Fluidic Sensors; Noha Gaber** Interferometric methods for detecting the refractive index of liquid solutions are known for their high sensitivity, but on the expense of their large size. However upon using wedge interferometry, the size can be drastically reduced while maintaining good detection capabilities. In this work, a miniaturized refractometer based on this interferometer type is demonstrated. This structure causes interference pattern that shifts depending on the refractive index of the test liquid inside. Analytical modeling is developed for

	the structure, from which a very promising estimation of the sensitivity is evaluated that exceeds the state-of-the-art for volume refractometry. Experimental demonstration of the device principle is presented by a simply fabricated version, from which successful discrimination of glucose solution from DI-Water is achieved.
077	**Dual Polarized Asymmetric Double-Grating-Gated Plasmonic for Terahertz; Ahmed M. Attiya** Asymmetric double-grating-gate (A-DGG) for a plasmonic 2D electron gas is found to be an efficient method for THz detection and rectification. However, conventional A-DGG is suitable only for a polarization normal to the direction of the gating structure. This is due to the fact that conventional A-DGG is an asymmetric grating structure in 1D. In this paper a modification of this A-DGG is presented to be 2D asymmetric grating structure. Thus, the proposed modified A-DGG is suitable for two orthogonal polarizations simultaneously. This property makes the proposed THz detector (rectifier) less depending on the polarization of the incident wave
114	**Optical Transmission and Reflection of Single- and Multi-Walled Carbon Nanotubes in the NIR; Ahmed Saeed, Yasser M. Sabry, Ahmed A. Elsayed, H.A.Shawkey, Diaa Khalil** In this work, we investigated the optical properties of both semiconducting single-walled carbon nanotubes (SC-SWCNTs) and metallic multi-walled carbon nanotubes (M-MWCNTs) in terms of their transmittance and reflectance in the Near-Infrared (NIR) up to 2500 nm wavelength . The measurements showed that a 100-µm thick sheet of SC-SWCNTs has a transmittance as low as $7.4x10^{-4}$, while a sample of dispersed M-MWCNTs in a DMF solution can have even smaller transmittance of $6.5x10^{-5}$. The reflectance spectra for both samples are measured demonstrating very low-level reflectance values of 0.02 and 0.013, respectively. The results suggest that both types of CNTs are highly absorbing materials in the Near-Infrared (NIR) range.
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A41	**Micro and Nano-sensors 2**
052	**Gas Selectivity Studies of Metal Oxides Nano-Surfaces from First Principle Approach; Amos Adeleke Akande, Kittesa Roro, Diaa Rayan, Mohammed Rashad, Bonex Mwakikunga** Comparative gas selectivity studies of some metal oxide materials were carried out by first principle methods calculations within the formalism of density functional theory. Among the thermodynamically stable surfaces (planes) in V_2O_5 orthorhombic system, (001),(110),(200) and (400) exhibited different adsorption properties to NH_3 molecule (s). NH_3 molecules were found to minimize their energy greatly on (001), (200) and (400) low miller index of the system than (110). The profile of adsorption energy per number of NH_3 molecule versus numbers of NH_3 molecule simulates the plot of

	response (%) versus NH_3 gas concentration derived from experimental sensing of NH_3 gas with V_2O_5 nanomaterials. Electronic band structures, density of states and electron density differences of these adsorbed surfaces also supported the adsorption profile. The band gaps of the core plane (110) surfaces showed exponential decrease with the numbers NH_3 molecules. Similar calculations and analyses were done for WO_3, ZnO and TiO_2 materials.
106	**Fabrication, Characterizations and Vapor Sensing Characteristics of Type I Heterostructure Employing 2D ZnO Nanosheets and 2D RGO; Sanghamitra Ghosal, Partha Bhattacharyya** In this work, fabrication of type I 2D heterostructure consisting of ZnONs (Nanosheet) and RGO (Reduced graphene Oxide), is reported. After detailed structural, morphological and optical characterization, the device was exposed to alcohol vapors to ascertain its potentiality as a chemical sensor device. Developed sensor offers very promising characteristics in terms of operating temperature (90°C), response magnitude (87.65% at 400 ppm) and recovery time (17s) as compared to its pristine ZnO nanosheet counterpart (160°C,54.81%, 33s, respectively). The possible reason for such improvement of the fabricated heterostructure is the formation of localized type I heterojunction between 2D ZnO and 2D RGO, where the depletion region penetrates almost fully on both sides (due to the 2D nature of the constituent). Moreover, high carrier mobility of RGO leads to faster response kinetics which was further co-related with the corresponding energy band diagram.
107	**Integrated Gas Sensor Device Using RGO/TiO_2 Nanotube Hybrid Sensing Layer and Embedded Pt Microheater for Efficient H_2 Detection; Partha Bhattacharyya, Sanghamitra Ghosal** In the present paper, fabrication, characterizations and H_2 sensing performance of integrated micro-sensor device consisting of Reduced Graphene Oxide (RGO) and TiO_2 nanotubes (NTs) hybrid layer as the sensing element, along with embedded Pt microheater, is reported. The Ti-Pt (10nm/80nm) micro-heater and temperature sensor was fabricated and was used to control the temperature of the sensing layer. The temperature Coefficient of Resistance (TCR) was found to be 0.001595 between 27 °C to 200 °C. After that 150 nm of Ti metal was sputtered on top of the insulated microheater. TiO_2 nanotube array was synthesized by electrochemical anodization method followed by electro-deposition of RGO in the form of distributed clusters. After detailed characterizations, gas sensing potentiality of the hybrid device was tested for detection of hydrogen (20-700 ppm) and the sensing performance was compared with that pristine structure to validate the improvement caused by the incorporation of a secondary element (RGO). The hybrid sensor showed □41.39% and □94.61% response magnitude towards 20 ppm and 700 ppm of H_2 respectively, at optimum temperature of 75 °C. The significant improvement

	in response magnitude makes such integrated sensor appreciably hydrogen selective, compared to some of its nearest interfering neighbors like H_2S and SO_2.
108	**Performance Improvement of TiO_2 Nanoflowers Based Gas Sensor Devices Incorporating Pd and rGO as the Surface Modifier: A Comparative Study; Indranil Maity, Debanjan Acharyya, Partha Bhattacharyya** The present paper is about a comparative study on the improved acetone sensing performance of TiO_2 nanoflowers based gas sensor devices via two most promising surface modification routes; (i) by using catalytic noble metal (Pd) nanoparticles, (ii) surface decoration by reduced graphene oxide (rGO) in the form of distributed islands. To confirm the formation of these two binary hybrid structures (Pd-TiO_2 NFs and rGO-TiO_2 NFs), characterizations viz. FESEM and Raman spectroscopy were performed. Acetone was used as the test species in the concentration range of 1-700 ppm for the above two types of composite structure and the results of the sensing performance were also compared with its pristine TiO_2 NFs counterpart. Significant improvement was observed for these two hybrid devices compared to the unmodified one due to the catalytic effect of Pd nanoparticles and high surface to volume ratio along with very high carrier mobility of the rGO layer. The best performance among these three nanostructures in terms of operating temperature and response magnitude was found as follows: i) lowest operating temperature was observed for Pd-TiO_2 NFs structure (50°C) and ii) highest response magnitude was observed for rGO-TiO_2 NFs structure (90.02% towards 700 ppm concentration of acetone vapor).
061	**Near Field Imaging Enhancement Beyond Diffraction Limit Based Hyperbolic Matamaterial; Norhan Salama, Mohamed A.Swillam** Recent theoretical work suggested the possibility of super resolution diffraction free inside hyperbolic metamaterial based doped/intrinsic InAs semiconductor heterostructure integrated with upper metal slit. However, focusing in the near field is ambiguous. In this work, we theoretically demonstrate sub-wavelength focusing in the near field using aforementioned structure. We used finite difference time domain method software (Numerical) for theoretical investigation. We modify the structure for achieving and enhancing focusing in the near field. The modified structure is integrated with lower slit for enhancing the resolution. The key proposition of focusing in the near field is achieving of focusing point inside the HMM and transmitting the focused field outside the structure. Focusing outside is enhanced with enhancement of the evanescent waves. The doping concentration of InAs is Nd=1e19cm-1. Focusing in the near field is achieved for λ= 16.24μm with a resolution 0.137λ away 250nm from the multilayer stacks for single slit structure. By adding a metal slit lower to the structure, focusing resolution is enhanced to be 0.096λ at the same point. The study has significant impact for thermal imaging and energy harvesting applications.

B41	Nanotechnology Challenges
036	**Ethical Issues of Nanotechnology: Inevitable or Soluble Obstacles to Nanotechnology Contribution to Sustainable Development; Bahaa Darwish** Though nothing is more difficult than giving a clear and consensual definition of the term "nanotechnology", what is consensual is that nanotechnology is a set of technologies, rather than one technology, that enables the manipulation, study or exploitation of very small (typically less than 100 nanometers) structures and systems. Nanotechnology can also contribute to novel materials, devices and products that have qualitatively different properties. Its advances have the potential to affect virtually every area of economic activity and aspect of daily life. Since nanotechnology has such potentiality and since ethics of science is the driving wheel that directs science and technologies towards the good- and away from the harm- of man, and since the Arab world has shown recent interest, and economical appreciation, in the development and use of nanotechnologies, it is high time to address the ethical issues that may hinder such development in the Arab world. The researcher claims that there is, so far, no document, in the Arab world, that discusses, and thus suggests regulating, the ethical issues of such technology in spite of the growing interest in developing and using it. Therefore, this paper will start by showing the current situation of nanotechnology in the different Arab countries, the growing awareness of its importance, and the consequent inclusion of nanotech in the national, as well as the Arab regional, scientific research strategies. In an attempt to evaluate the Arab achievement in such domain, the paper will, next, discuss the obstacles that, we claim, hinder its contribution in economic development. Thirdly, we will discuss the ethical issues that may result from the development and use of the nanotech. Some of these ethical fears are global and some are regional. Finally, we will end our paper by suggesting some ways of tackling such fears, thus giving way to nanotechnology to contribute to development.
037	**Synthesis, Characterization and Evaluation of Conductive Nanocomposites (Cncs) for Electronic and Biotechnical Applications; Ragia Mohsen,Yosrya Abu-ayana, Samir Morsi** This article summarizes synthesis, characterization and evaluation of conductive nanocomposites (CNCs) for electronic and biotechnical applications. Review of synthesis and characterization of conductive polymer nanoparticles (NPs) as the CNCs matrix, and conductive fillers as metal nanoparticles, carbon nanotube (CNT) will be summarized. Different applications of CNCs in electronic field as sensors, conductive adhesive, conductive blocks and sheets, and anticorrosive protective coatings….etc are showed. Also, biotechnical applications of CNCs as biosensors and their use

	in food packaging occupied superior position in nanotechnology. Some hints on project no. 10050408 were carried out by the author and the team work in National Research Center (NRC) from (2013-2016) entitled "Synthesis, evaluation and applications of conductive polymer nanocomposites".
124	**Nano-Technology: Challenge for Advanced Application; Inas Battisha, Hanan ABD El Zaher, Magdy Ayoub, Amal Amin, Eman H. Ahmed, Claudia Wickleder, Matthias Adlung, Wafaa Moussa, Olfat El Sayed, Mimoun El Marssi, Abd Il-Ilah Lihmar** The phospho-silicate-Er^{3+} and hybrid-phospho-silicate-polyamidoamine-hyperbranched-polymer-Er^{3+} nanocomposites and the co- doped with trivalent (Ho^{3+}) ions and activated with (Yb^{3+}) ions as sensitizer are promising candidates for photonic specially planar waveguide applications. While $BaTiO_3$-Sn-RE can be used as information storage. Finally the ZnO nano-rod can act as biosensor used for measurement of extra/intracellular ions.
128	**Progress of Nanoprecision Materials for Cancer Therapy; Nehal Salahuddin** In medicine, nanotechnology has sparked a rapidly growing interest as it promises to solve a number of issues associated with conventional therapeutic agents, including their poor water solubility (at least, for most anticancer drugs), lack of targeting capability, nonspecific distribution, systemic toxicity, and low therapeutic index. The reduction of materials to the nanoscale that has the same size as biomolecules facilitates their interaction with cell biomolecules and favors their physical transport into the interior structures of cells. Nanoparticles may be made from a variety of materials including polymers, inorganic nanoparticles, and polymers/inorganic nanocomposites. In addition to chemotherapeutic payloads, nanoparticles can incorporate nonbioactive elements useful as diagnostic and device agents. Factors affecting the efficacy of nanoparticles for chemotherapy delivery system and the characteristics of ideal nanoparticles were explained. Spots on the physicochemical characteristics of the drug deliveries in compliance with their corresponding therapeutic efficiency, against different cancer cell lines, as well as the advantageous medicinal performance of each drug carrier pinpointing the most targeted site of action.