IC-MAST 2011

International Conference on Materials and Applications for Sensors and Transducers

Organized by:

National Technical University of Athens

University of Peloponnese

Preface

ICMAST-2011 is an international interdisciplinary conference covering research and development in the field of material science, especially those materials used for sensors, actuators, and all kind of devices used for transducing physical signals. Furthermore, ICMAST-2011 aims to bring together scientists, engineers and product designers in order to fulfill the gap between research and development.

The scope of the conference encompasses, but is not restricted to, the following areas:

- New materials development
- Fabrication technology
- Sensing principles and mechanisms
- Actuators
- Optical devices
- Electrochemical devices
- Mass-sensitive devices
- Gas sensors
- Biosensors
- Analytical microsystems
- Environmental, process control and biomedical applications
- Signal processing
- Sensor and sensor-array chemometrics
- Physics of materials such us: classification of physical effects, measurement theory, modelling of sensors etc.
- Processing of materials such as: piezoelectric materials, polymers, metal oxides, III-V and II-VI semiconductors, thick and thin films, optical glass fibres, amorphous, polycrystalline, monocrystalline silicon etc.

- Optoelectronic sensors such as: photovoltaic diodes, photoconductors, photodiodes, phototransistors, positron-sensitive photodetectors, optoisolators, photodiode arrays, charge-coupled devices, light-emitting diodes, injection lasers, liquid-crystal displays etc.
- Mechanical sensors such as: metallic, thin-film and semiconductor strain gauges, diffused silicon pressure sensors, silicon accelerometers, solid-state displacement transducers, piezo junction devices, piezoelectric field-effect transducers (PiFETs), tunnel-diode strain sensors, surface acoustic wave devices, silicon micromechanical switches, solid-state flow meters, electronic flow controllers etc.
- Thermal sensors such as: platinum resistors, thermistors, diode temperature sensors, silicon transistor thermometers, integrated temperature transducers, PTAT circuits, thermocouples, thermopiles, pyroelectric thermometers, quartz thermometers, power transistors, thick-film thermal print heads etc.
- Magnetic sensors such as: magnetoresistors, Corbino disks, magnetodiodes, Hall-effect devices, integrated Hall devices, silicon depletion-layer magnetometers, magneto-injection transistors, magnistors, lateral magnetotransistors, carrier-domain magnetometers, MOS magnetic-field sensors, solid-state read and write heads etc.
- Micromechanics applications such as: research results on actuators, structures, integrated sensors-actuators, microsystems, micromechatronics, microelectromechanical systems, microoptomechanical systems, microchemomechanical systems, microrobots, analysis of microsystems, exploration of new topics and materials related to micromechanics, microsystem-related problems like power supplies and signal transmission, microsystem-related simulation tools etc.
- Interface electronics
- Sensor Systems and Applications

Conference details

International Conference on Materials and Applications for Sensors and Transducers
May 13-17, 2011, Kos Island Greece

Chairmen

E. Hristoforou, National Technical University of Athens, School of Mining and Metallurgy Engineering
D. Vlachos, University of Peloponnese, Department of Computer Science and Technology

Scientific Committee

D. Sakas, University of Peloponnese
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R. Germano, Promete, Naples, Italy
I. Raptis, NCSR "Demokritos", Athens, Greece

Organizing Committee

D. Vlachos, University of Peloponnese
D. Sakas, University of Peloponnese
C. Christopoulos, SCEV Scientific Events Ltd
A. Mavrogianni, University of Athens

Invited Speakers

D. Kouzoudis, University of Patras, Editor-in-Chief, Sensor Letters
M. Popescu, Editor-in-Chief, Journal of Optoelectronics and Advanced Materials
R. Germano, PROMETE Srl - CNR Spin off
A. Widom, Northeastern University, Boston (USA)
D.K. Aswal, Bhabha Atomic Research Center

Conference Programme

Opening - Friday 13 May

09:30 - 16:30	Arrival
16:30 - 20:00	Registration
20:00 -	Welcome drink

Oral Sessions - Saturday 14 May

	Biosensors
09:30 - 10:00	A Novel L-Lactate Sensor Based on Enzym Electrode Modified with ZnO Nanoparticles and Multiwall Carbon Nanotubes *Zhu J, Wang Y, Yu L, Zhu Z, Peng H*
10:00 - 10:20	Optical Detection of the Pesticide by Functionalized Quantum Dots as Fluorescence-based Biosensor *Nga PT, Hai N, Chinh V*
10:20 - 10:40	Cyclodextrin-Based Supramolecular Multilayer Assemblies for the Design of Biological Optical Sensors Using Tilted Fiber Bragg Gratings *LéPinay S, Volet G, Wintgens V, Laffont G, Ferdinant P, Millot M, Carbonnier B*
10:40 - 11:00	Folic Acid Functionalized Au Surface via Click Reaction and its Application in Cancer Cells Electrochemical Sensor *Shen X, Liu Y, Ge Z*
11:00 - 11:30	*Coffee break*
	Chemical Sensors
11:30 - 12:00	Multi-Walled Carbon Nanotube based Sensors for detection of Chemical Pollutants *Lopes I, Gohier A, Porterat D, Chenevier P, Deniau G, Palacin S, Mayne-L'Hermite M, Reynaud C*
12:00 - 12:20	Optical Electronic Nose Based on Fe(III) Complex of Porphyrins Films for Detection of Volatile compounds *Yahaya M, Ali Umar A, Mat Salleh M*

12:20 - 12:40	Fast Diagnosis of Volatile Organic Compounds with a Temperature-modulated Chemoresistor *Amini A, Hosseini-Golgoo M*
12:40 - 13:00	Silver-Rutile UV Sensor Fabricated on Thermally Oxidized Titanium Foil *Lajvardi MM, Hossein-Babaei F, Boroumand FA*
13:00 - 15:00	-
	Gas Sensors
15:00 - 15:30	Hydrogen Detection with Noble metal-TiO2 Schottky Diodes *Rahbarpour S, Hossein-Babaei F*
15:30 - 15:50	Single Sensor Gas Analysis Using a Microfluidic Channel *Ghafarinia V, Hossein-Babaei F*
15:50 - 16:10	Sensing Element made of Multi-wall Carbon Nanotube Network for Organic Vapor Detection *Olejnik R, Slobodian P, SáHa P*
16:10 - 16:30	Polymer Coated Microfabricated Interdigitated Electrodes Arrays for Gas Sensing Applications *Oikonomou P, Manoli K, Goustouridis D, Botsialas A, Valamontes E, Raptis I, Sanopoulou M*
16:30 - 17:00	*Coffee break*
	LECS - Low Energy Coherent Systems
17:00 - 17:30	Water Plasma Modes and Nuclear Transmutations on the Metallic Cathode of a Plasma Discharge Electrolytic Cell *Widom A, Cirillo D, Germano R, Tontodonato V, Del Giudice E, Vitiello G, Srivastava Y, Sivasubrammanian S*
17:30 - 17:50	Experimental Evidence of a Neutron Flux Generation in a Plasma Discharge Electrolytic Cell *Germano R, Cirillo D, Tontodonato V, Widom A, Srivastava Y, Del Giudice E, Vitiello G*
17:50 - 18:10	Effect of coordination of molecules on the properties of water as solvent *De Ninno A, Congiu Castellano A*
17:50 - 18:10	Effect of coordination of molecules on the properties of water as solvent *De Ninno A, Congiu Castellano A*
18:10 - 18:30	Nanostructures of Water Molecules in Iteratively Filtered Water *Elia V, Napoli E*
18:30 - 18:50	Oxhydroelectric Effect: Electricity from Water by Twin Electrodes *Germano R, Tontodonato V, Hison C, Cirillo D, Tuccinardi F*

Oral Sessions - Sunday 15 May

	Invited Lectures
09:30 - 10:30	Invited lecture by Prof D Kouzoudis
10:30 - 11:30	Invited lecture by Prof M Popescu
12:00 - 17:00	*Excursion*
17:00 - 20:00	-
20:00 -	Central Dinner

Oral Sessions - Monday 16 May

	Magnetic Effects for Sensing Applications
09:30 - 10:00	Temperature Response of Magnetostrictive/Piezoelectric Polymer Magnetoelectric Laminates *Gutierrez J, Lasheras A, BarandiaráN J, Vilas J, San SebastiáN M, LeóN L*
10:00 - 10:20	Investigation on the Magnetic Noise of Stacked Magnetostrictive-Piezoelectric Laminated Composites *Zhuang X, Dolabdjian C, Saez S, Lam Chok Sing M, Cordier C, Li J, Viehland D, Mandal S, Sreenivasulu G, Srinivasan G*
10:20 - 10:40	Investigation of Strain Sensing Capabilities of Amorphous Magnetostrictive Wires Embedded in Epoxy Resin *Christopoulos A*
10:40 - 11:00	Magnetoelastic Viscosity Sensor for Lubricant Oil Condition Monitoring *Bravo-Imaz I, GarcíA-Arribas A, Gorritxategi E, Hernaiz M, Arnaiz A, Terradillos J, Barandiaran J*
11:00 - 11:30	*Coffee break*
	Sensitive Magnetometers
11:30 - 12:00	Magnetic Techniques for Sensitive Field Sensor Measurement *Hristoforou EV*
12:00 - 12:20	Low Frequency Measurements in Amorphous Wire for Studying GMI Effect *Vourna P*

12:20 - 12:40	Effective Control of the Magnetic Behavior of Thin Cobalt Films Deposited by MOCVD *Papadopoulos N*
12:40 - 13:00	Magnetic Field Sensor Based on the Domain Wall Nucleation and Propagation *Kokkinis G*
13:00 - 15:00	-
	Applications of Magnetic Sensors
15:00 - 15:30	Device and Method of Volume Distribution Measurement and Selective Heating of Super-paramagnetic Nanoparticles *Kokkinis G, Vlachos DS, Hristoforou EV*
15:30 - 15:50	Correlation Between Barkhausen Noise and Plastic Deformation in TRIP 800 Steel Specimens *Varouti E*
15:50 - 16:10	Use of Magnetic Techniques to Evaluate the Mechanical Properties of Duplex Stainless Steels *Giannouli C*
16:10 - 16:30	Cordless Position Sensor based on the Magnetostrictive Delay Line Principle *Kokkinis G*
16:30 - 17:00	*Coffee break*
	Modeling and Simulation
17:00 - 17:30	Physics and Modeling of Magnetic Non Destructive Testing Techniques *Ktena A*
17:30 - 17:50	Numerical Study of a Structure Containing Left-handed Material Waveguide *Ubeid MF*
17:50 - 18:10	Study and Application of Micrometric Alignment on the Prototype Girders of the CLIC two-beam Module *Gazis NE*
18:10 - 18:30	Modeling the Effect of Cluster Size on Sensitivity using Complex Networks *Vlachos DS*

Oral Sessions - Tuesday 17 May

	Carbon Nanotubes
09:30 - 10:00	Monitoring Deep Vein Thrombosis by Electrochemical Immunosensor based on His-Tag D-dimer Antibody attached to Multi walled Carbon Nanotubes *Korri-Youssoufi H, Chebil S, Hianik T*
10:00 - 10:15	Surface Enhanced Oxidation and Determination of Isothipendyl Hydrochloride at an Electrochemical Sensing Film Constructed by Multiwalled Carbon Nanotubes *S.N. P, S.Kalanur S, L.Teradal N, Seetharamappa J*
10:15 - 10:30	Fabrication of Carbon Nanotube/Low Density Polyethylene Composites for Strain Sensing *Abdel Chafy RR, Arafa M, Esawi A*
10:30 - 11:45	Batch Welding of Aligned Carbon Nanotubes onto Metal Electrodes *Chen M, Song X, Gan Z, Lv Q, Liu S*
10:45 - 11:00	Interaction of Graphene with Rhodamine 6G: A Fluorescence Quenching Study *Cui Y, Shen X*
11:00 - 11:30	*Coffee break*
	Magnetic Materials
11:30 - 12:00	Design and Construction Considerations in Modern MOCVD Systems: an Experimental Approach *Papadopoulos N*
12:00 - 12:15	Growth, Structural and Mechanical Characterization and Reliability of Chemical Vapor Deposited Co and Co3O4 Thin Films as Candidate Materials for Sensing Applications *Tsikourkitoudi VP, Koumoulos EP, Papadopoulos N, Charitidis CA*
12:15 - 12:30	An Experimental Investigation of Magnetorheological (MR) Fluids under Quasi-Static Loadings *Mazlan SA, Ismail I, Fathi MS, Rambat S, Anis SF*
12:30 - 12:45	Fabrication and First Characterization of Ni2MnGa Glass-coated Microwires *Varga R, Ryba T, Saksl K, Zhukova V, Zhukov A*
12:45 - 13:00	A Study of the Early Stage of Ni{100-x}Fe{x} Electrodeposited Thin Films *Messaadi S, Daamouche M, Guittoum A, Fenineche N, Medouer H, Zidani I*
13:00 - 15:00	-
	Optical materials
15:00 - 15:30	Refractive Index Sensing based on a Fiber Bragg Grating with Micro-holes *Wang D*

15:30 - 15:50	Metrological Performances of Smart Structures based on Bragg Srating Sensors *De Cais E, Borotto M, Belloli M, Bernasconi A, Manzoni S*
15:50 - 16:10	Metrological Performances of Fiber Bragg Grating Sensors and Comparison with Electrical Strain Gauges *Borotto M, De Cais E, Manzoni S, Belloli M, Bernasconi A*
16:10 - 16:30	Possibilities for Thick, Simple-Structure Silicon X-Ray Detectors Operated by Peltier Cooling *Matsuura H, Hullinger D, Okada R, Kitanoya S, Nishikawa S, Decker K*
16:30 - 17:00	*Coffee break*
	Materials-Miscelaneous
17:00 - 17:30	Effect of Sintering Temperature on Microstructure and Electrical Properties of Nano Zinc Oxide Varistor *Mirzayi M, Hekmatshoar M, Azimi A*
17:30 - 17:50	Electrical Permittivity of Polyvinylidene Fluoride Nanocomposites Filled with Organoclay and Graphite Nanoplatelets: Compared and Contrasted *Tjong S*
17:50 - 18:10	Glutathione-assisted Synthesis of Hierarchical PbS via Hydrothermal Degradation and its Application in the Pesticidal Biosensing *Shen X, Li Z, Cui Y, Pang Y*
18:10 - 18:30	Ferromagnetic Shape Memory Alloys Thin Films for MEMS *BarandiaráN MJ, Chernenko V, GutiéRrez J, Aseguinolaza I*

Poster Session - Saturday 14 - Tuesday 17 May

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Virtual papers - Saturday 14 - Tuesday 17 May

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Biosensors

Saturday, May 14

09:30 - 11:00

A Novel L-Lactate Sensor Based on Enzym Electrode Modified with ZnO Nanoparticles and Multiwall Carbon Nanotubes

Jianzhong Zhu[1c], Yiting Wang[1], Lei Yu[1], Ziqiang Zhu[1], Hui Peng[1]

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Abstract: A highly sensitive and stable L-Lactate sensor based on the synergic action of multi-wall carbon nanotube (MWCNTs) and ZnO nanoparticles has been developed. The unique sandwich-like layer structure (PDDA/LOD/ZnO/MWCNTs) provides a favorable microenvironment to keep the bioactivity of LOD and prevent enzyme molecule leakage. Therefore, the proposed biosensor exhibited good analytical performances to amperometric determination of L-Lactate.

Keywords: Biosensors, Lactate, ZnO nanoparticles, Carbon nanotubes

Optical Detection of the Pesticide by Functionalized Quantum Dots as Fluorescence-based Biosensor

Pham Thu Nga[1c], Nguyen Ngoc Hai[1], Vu Duc Chinh[1]

[1]*Institute Of Materials Science, Vietnam Academy Of Science And Technology (Vast), Optics And Spectroscopy*

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Abstract: In this work, the results of biosensor composed from the quantum dot as transducer and acetylcholinesterase enzymes (AChE) to optically detect pesticides are presented. The quantum dots we used were CdTe, CdSe/ZnS and CdSe/ZnSe/ZnS – the thick shell QDs that are totally new. The study results pointed out that the CdSe/ZnSe/ZnS quantum dots best fit for the role of transducers in biosensors. In the biosensors, acetylthiocholine (ATCh) is used as subtract for the enzymes to work, since it is a very powerful hydrolyte with the presence of AChE enzymes. On the other hand, the organophosphorus (OP) pesticides are the inhibitor for the AChE enzymes, so that with the biosensors that we designed, we can detect pesticides by the change in PL intensity of QDs, with the detection of OP like parathion methyl is 0.0125 ppm, and acetamiprid is 0.625 ppm. The sensors show the same response that the photoluminescence (PL) intensity decreases when the pesticide concentration increases with both of the pesticides mentioned above

Keywords: Fluorescence, Optical Nanosensor, Quantum Dots, Organophosphorus Pesticide, Optical Detection, Enzyme Biosensor

Cyclodextrin-Based Supramolecular Multilayer Assemblies for the Design of Biological Optical Sensors Using Tilted Fiber Bragg Gratings

Sandrine LéPinay[1c], Gisele Volet[2], VéRoniqe Wintgens[2], Guillaume Laffont[3], Pierre Ferdinant[3], Marie-Claude Millot[2], Benjamin Carbonnier[2]

[1]*Institut De Chimie De MatéRiaux De Paris-Est - Cnrs,*

[2]*University Paris-Est CréTeil Icmpe Cnrs Umr 7182,*

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Abstract: In this work, we demonstrate the possibility to use optical fiber incorporating photowritten tilted fiber Bragg gratings (TFBG) as optical detection system for the real time monitoring of interfacial adsorption events and biological recognition. For this purpose, immobilization of cyclodextrin polymers onto the surface of optical fiber was envisioned through the layer-by-layer self assembly method with the aim of developing sensing layers with well-defined host properties. To develop a biological sensor, amphiphilic dextran, acting as intermediate layer between the polyelectrolyte multilayer assembly and the biological probe, was immobilized though inclusion complex formation. The dextran layer exhibit a dual functionality: (i) it prevents non-specific proteins adsorption and (ii) it allows covalent immobilization of anti-bovine serum albumine through activation of the hydroxyl groups with 1,1'-carbonyl diimidazole. To verify the feasibility of our strategy, fluorescence microscopy was applied to evidence the effective inclusion of fluorescent macromolecular – flurorescein labelled dextran bearing adamantane as side-grafts – species within the cyclodextrin cavities present onto the optical fiber interface and at the last layer to prove the grafting of anti bovin serum albumin onto the amphiphilic dextran by a capture of fluorescein bovin serum albumin by the antibody layer. In a further step, it was demonstrated that the elaboration of the multilayer assembly can be monitored in real time using the TFBG sensor.

Keywords: Cyclodextrin, Supramolecular multilayer, Titled fiber Bragg gratings, Biosensor, Inclusion complex, Bovin serum albumin

Folic Acid Functionalized Au Surface via Click Reaction and its Application in Cancer Cells Electrochemical Sensor

Xiaofang Shen[1c], Yong Liu[1], Zhaoqiang Ge[1]

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Abstract: Herein, we report a method to immobilize FA by "click chemistry" on azidefunctionalized self-assembled monolayer (SAM) coated gold electrode. We prepared mixed SAMs by depositing a mixed solution of two different thiols, an azide-terminated alkyl thiol (linker) and a 6-hydrosulphonyl-1-hexanol (diluent). Deposition occurs within 24 h, and the excess reagents were removed by rinsing the surfaces with ethanol. Copper-catalyzed coupling of the alkynes with the gamma-azido-FA precursor was accomplished in highly specific binding and in high yields. In vitro, all FA modified gold electrode exhibited high affinity toward the folic acid receptor (FR) and was specifically internalized into FR-overexpressing K562 cells.

Keywords: Folic acid; Click chemistry; Electrochemical sensor; Live Cell.

Chemical Sensors

Saturday, May 14

11:30 - 13:00

Multi-Walled Carbon Nanotube based Sensors for detection of Chemical Pollutants

IrèNe Lopes[1c], AuréLien Gohier[1], Dominique Porterat[1], Pascale Chenevier[1], Guy Deniau[1], Serge Palacin[1], Martine Mayne-L'Hermite[1], CéCile Reynaud[1]

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Abstract: Over the last decade, great efforts have been undertaken to exploit carbon nanotubes (CNT) as new gas sensing materials. Because of their high specific surface area and their large gas adsorption capacity, CNT-based sensors are expected to reach high sensitivity with fast response. The changes of CNT electrical properties upon gas exposure have already studied in literature. This work is focused on the design of a resistive gas sensor based on CNT synthesized by using an aerosol assisted chemical vapour deposition process. The loaded CNT onto electrodes act as resistors and the conductance changes are measured upon gas exposure. Toxic industrial chemicals (TIC) like chlorine, hydrogen chloride, and ammonia are widely used in many industrial processes and are known to be very damaging. Therefore, the demand is high for compact solid-state and low cost gas sensors to detect them in the sub-ppm range. Besides, with the aim to enhance the sensor sensitivity and selectivity, for detection of several gases, CNT were functionalized by using a process based on the diazonium chemistry. In this paper, we will demonstrate that the optimized devices are operating at room temperature, for the detection of pollutants. In the case of chlorine detection is possible down to 30 ppb.

Keywords: nanomaterial, carbon nanotubes, sensor, sensitive, selectivity, surface modification

Optical Electronic Nose Based on Fe(III) Complex of Porphyrins Films for Detection of Volatile compounds

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Abstract: Electronic nose is a device that attempts to mimic the living being smell system for detection of particular gases or volatile compounds. This paper reports the development of an optical electronic nose using Fe(III) based metalloporphyrins Langmuir-Blodgett thin films as sensing elements for discriminating four volatiles, 2-propanol, acetone, cyclohexane and ethanol. A multilayer feed forward neural network was developed to classify the input vectors from these two sensors. After the network being trained 100 times and introduced to blind samples, it was found that there are three fault decision for propanol, two for acetone, five for cyclohexane and one four ethanol, during 50 times being recognized to the samples.

Keywords: optical electronic nose; neural network; back propagation algorithm; metalloporphyrins

Fast Diagnosis of Volatile Organic Compounds with a Temperature-modulated Chemoresistor

Amir Amini[1c], Mohsen Hosseini-Golgoo[2]

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Abstract: Virtual arrays formed by operating temperature modulation of a commercial non selective chemoresistor have been utilized for gas identification. Here, we are reporting the details of a refined system which distinctly classifies methanol, ethanol, 1-butanol, acetone and hydrogen contaminations in a wide concentration range. A staircase voltage waveform of 5 plateaus is applied to the sensor's microheater and gas recognition is achieved in 25 s. Sensor's output is modeled by an "autoregressive moving average with exogenous variables" (ARMAX) model. The modeling parameters obtained for an unknown analyte are utilized as the components of its feature vectors which afford its classification in a feature space. Cross-validation in the 5 to 100 ppm concentration range for H2, and 200 to 2000 ppm for the other analytes examined, resulted in an overall classification success rate of 100%.

Keywords: Gas sensor, Gas analysis, Virtual array, Electronic nose, Temperature modulation, Chemoresistor

Silver-Rutile UV Sensor Fabricated on Thermally Oxidized Titanium Foil

Mehdi Mohamadzade Lajvardi[1c], Faramarz Hossein-Babaei[2], Farhad Akbari Boroumand[2]

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Abstract: A UV-sensitive Schottky diode of Ag-rutile-Ti structure is fabricated on a thermally oxidized titanium chip. The junction is formed by the thermal evaporation of silver in vacuum and a subsequent controlled annealing process. Applying a biasing voltage of -300 mV, the reverse current of the fabricated silver-rutile-titanium structure increases five orders of magnitude under 50 μW/mm2 UV illumination (lambda=355 nm). The device is visible-blind and its operation is described based on the photoelectric mechanism in the carrier-depleted oxide layer. The dominance of the photoelectric, rather than photoconductive, mechanism along with the dense rutile layer are responsible for the fast transient times observed. The response and recovery times of the device are 800 μs and 7 ms, respectively.The device is stable and extremely cost effective.

Keywords: UV sensor, Schottky diode, Ag-TiO2 diode, Titanium thermally oxidation

Gas Sensors

Saturday, May 14

15:00 - 16:30

Hydrogen Detection with Noble metal-TiO2 Schottky Diodes

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Abstract: Fast detection of hydrogen at a wide concentration range is desired for many applications. We report detecting hydrogen using Au-TiO2-Ti and Ag-TiO2-Ti diodes. While hydrogen-Au and hydrogen-Ag interactions are very different, at a constant biasing voltage, the measured current in both diodes is highly sensitive to the partial pressure of hydrogen contamination in the surrounding atmosphere. Work function variations were investigated by connecting the I-V specifications to the energy barrier height established at the Au-TiO2 and Ag-TiO2 junctions. Electronic features of the devices were described based on the assumption of two different hydrogen-noble metal interactions: Hydrogen reduces Ag work function by reducing the adsorbed oxygen species from the silver surface, while Au work function is reduced by the same mechanism as well as the direct adsorption of hydrogen species to the gold surface. Both of these mechanisms result in hydrogen detection by Schottky barrier height reduction and current increase.

Keywords: hydrogen sensor, gold on titanium dioxide, silver on titanium dioxide, Schottky diode, titanium oxidation

Single Sensor Gas Analysis Using a Microfluidic Channel

Vahid Ghafarinia[1c], Faramarz Hossein-Babaei[1]

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Abstract: We have recently disclosed a novel technique for gas analysis based on monitoring the free diffusion-physisorption of the analytes in a microfluidic channel. Equipped with a single general gas sensor, the prototype can recognize variety of gases and gas mixtures. Here, the structural details of the fabricated prototype are given. The performance of the prototype is demonstrated by presenting analysis results obtained for a number of pure and mixed gaseous analytes.

Keywords: gas analysis, microfluidics, diffusion, physisorption, transient response, chemoresistor, electronic nose, GASMEMS

Sensing Element made of Multi-wall Carbon Nanotube Network for Organic Vapor Detection

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Abstract: Multiwall carbon nanotubes (MWCNT) network "Buckypaper" was made by the vacuum filtration method of MWCNT aqueous suspension. The sensitivity of multi-wall carbon nanotube (MWCNT) networks of randomly entangled pure nanotubes to various organic solvent vapors (tetrahydrofuran, methyl ethyl ketone, and ethanol) has been investigated by resistance measurements. The results demonstrate that the network electrical resistance increases when exposed to organic solvent vapors, and a reversible reaction is observed when the sample is removed from the vapors. The investigated MWCNT networks could be potentially used as sensing elements for sensitive and selective organic vapor detection.

Keywords: carbon nanotube network, sensor, buckypaper, electrical resistance

Polymer Coated Microfabricated Interdigitated Electrodes Arrays for Gas Sensing Applications

Petros Oikonomou[1], Kyriaki Manoli[2], Dimitris Goustouridis[3], Athanassios Botsialas[1], Evangelos Valamontes[4], Ioannis Raptis[1c], Merope Sanopoulou[2]

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[2]*Ncsr 'Demokritos', Institute Of Physical Chemistry*

[3]*Tei Of Piraeus, Department Of Electronics*

[4]*Tei Of Athens,*

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Abstract: InterDigitated Capacitive (IDC) sensor arrays are fabricated with conventional microelectronics-micromachining technologies on quartz substrates. After fabrication, a polymeric well is patterned around each IDC to precisely define the sensing area and thus deposit coatings of various polymers, by drop casting, in a reproducible and controlled manner. The gas sensing performance of the IDC array is presented for humidity and p-xylene.

Keywords: gas sensor, chemocapacitor, polymer swelling.

LECS - Low Energy Coherent Systems

Saturday, May 14

17:00 - 18:30

Water Plasma Modes and Nuclear Transmutations on the Metallic Cathode of a Plasma Discharge Electrolytic Cell

Allan Widom[1c], Domenico Cirillo[2], Roberto Germano[2], Valentino Tontodonato[2], Emilio Del Giudice[3], Giuseppe Vitiello[4], Y Srivastava[5], S Sivasubrammanian[6]

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Abstract: In the conceptual framework of Quantum ElectroDynamics (QED) it has been proven that liquid water is made up of two phases : 1) a coherent phase where the electroncloud of water molecules oscillates in phase with a trapped electromagnetic field within extended regions, called Coherence Domains (CD); 2) a non coherent phase formed by a gas-like ensemble of molecules filling the interstices among the CD's. The constituent molecules of the coherent phase oscillate between their individual ground state and an excited state where one electron is so loosely bound to be considered quasi-free. Therefore the coherent phase contains a plasma of quasi-free electrons. In the bulk water, as in the case of super uid liquid Helium, each molecule crosses over continuously between the two phases. On the contrary, close to the surface of a metallic cathode in a chemical cell , the attraction between molecules and wall stabilizes the coherent phases so that the layer of interfacial water is mainly coherent and capable of holding a negative electronic charge. When the chemical cell voltage exceeds a threshold, an interfacial water-cathode metal surface plasma mode is developed. From the collective energies continuously pumped into the plasma, the weak interaction e- + p+ -> n + ve may be induced which produces neutrons and neutrinos from Hydrogen atoms. The neutrons may then ultimately induce other nuclear transmutations on the cathode metal surface.

Keywords: Surface Plasma Modes, Weak Interactions, Neutrons and Nuclear Transmutations, Low Energy Coherent Systems [LECS], Low Energy Nuclear Reactions [LENR]

Experimental Evidence of a Neutron Flux Generation in a Plasma Discharge Electrolytic Cell

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Abstract: A substantial neutron flux generated by plasma excitation at the tungsten cathode of an electrolytic cell with alkaline solution is reported. A method based on a CR-39 nuclear track detector coupled to a boron converter was used to detect the neutrons. This method is insensitive to the strong plasma-generated electromagnetic noise that made inconclusive all the previous attempts to identify neutrons in electrolytic plasma environment by means of electric detection techniques.

Keywords: neutron generation, plasma discharge, electrolytic cell, low energy nuclear reactions (LENR), low energy coherent systems (LECS)

Effect of coordination of molecules on the properties of water as solvent

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Abstract: IR spectra of mixtures of light and heavy water seem to provide a clear evidence for the existence of substructures, each of which may be assigned to a particular kind of water molecule on the basis of their correlation with the local environment. These substructures have been related to three different populations named correlated, non correlated and intermediate according to their degree of correlation. Experimental data analysis show that, in a mixture of H2O-D2O, each population participates differently to the solution process.

Keywords: Water, mixture H2O/D2O, solute, interface.

Nanostructures of Water Molecules in Iteratively Filtered Water

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Abstract: This work presents some experimental results on the variation of the physico-chemical properties of pure, twice distilled water, when subject to a procedure of iterative filtrations through Pyrex glass filters (Büchner funnels). The study involves the determination of electrical conductivity. After the filtrations, electrical conductivity increases three times. Part of those increases, about 10-30%, is to be attributed to impurities released by the glass filters. The hypothesis is that the remaining 70-90% of the increases comes from variations in the super-molecular structure of water. The iterative filtration procedure involves a flux of energy and material in an open system. The energy flux is partially dissipated as heat permitting the formation of "dissipative structures". Water, the main ingredient of living systems, exhibits an extraordinary auto-organization potentiality triggered by several kinds of perturbations, including mechanical ones.

Keywords: pure water, conductometry, dissipative structures, aqueous nanostructures, filtration, LECS - Low Energy Coherent Systems.

Oxhydroelectric Effect: Electricity from Water by Twin Electrodes

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Abstract: Electricity extraction from water by twin electrodes, mediated by oxygen molecules, that we call Oxhydroelectric Effect, is reported. The extremely simple components of this experimental system are: two platinum (Pt) wire electrodes, a saturated solution of potassium carbonate (K2CO3) in water (H2O) (with pH >10) as electrolyte, and a film of hydrophilic material (Nafion®). A DC power of the order of hundredths of nW was measured for days through a resistor connected to the twin Pt electrodes. The addition of a very small amount of hydrogen peroxide (H2O2) to the electrolyte (water-potassium carbonate solution with only 0.004% H2O2), as a source of oxygen, determines an immediate DC power jump, more than two orders of magnitude high, lasting for days. The Oxhydroelectric Effect opens the way to a completely new paradigm in what concern low-cost electrical energy generating systems, with a tremendously wide range of possible applications.

Keywords: electricity generation, water, oxygen molecules, twin electrodes, low energy coherent systems (LECS), Maxwell's Demon.

Magnetic Effects for Sensing Applications

Monday, May 16

09:30 - 11:00

Temperature Response of Magnetostrictive/Piezoelectric Polymer Magnetoelectric Laminates

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Abstract: Magnetostrictive/piezoelectric hybrid composites have recently attracted renewed interest as high sensitivity sensors and actuators. One of the most common used geometry consists in laminated amorphous magetostrictive metal/piezoelectric layers, and the maximum magnetoelectric effect has been found at the electromechanical resonance of the system. Here we present results concerning the fabrication of such laminate composites sensor by using Vitrovac 4040® (Fe39Ni39Mo4Si6B12) as the magnetostrictive amorphous component and two different piezoelectric polymers: poly(vinylidene fluoride) (PVDF) and 2,6(beta-CN)APB/ODPA (poli 2,6) polyimide, a new high temperature piezoelectric polymer. We have measured room temperature induced magnetoelectric voltages of 79,6 and 0,3 V/cm.Oe at the magnetoelastic resonance of the laminate when using PVDF and poli 2,6 polyimide as piezoelectric components. We have also tested the magnetoelectric response of both laminated composites at temperatures up to 85 ºC, and we have observed that the PVDF polymer piezoelectric response quickly decays. Even if the induced magnetoelectric voltage is low, we discuss the advantage of using new piezoelectric polymers due to their good performance at high temperatures, up to 200 ºC, making these laminate composites suitable for high temperature applications.

Keywords: magnetostrictive/piezoelectric polymer composite, magnetoelectric response, temperature dependence of the magnetoelectric response

Investigation on the Magnetic Noise of Stacked Magnetostrictive-Piezoelectric Laminated Composites

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Abstract: The performance of multi-segments magneto-electric (ME) layered sensors as charge sources has been investigated by using a typical charge amplifier. We found that the intrinsic performance of such sensors consisting of several (namely 3 and 5) segments, is the same whether these segments are connected in parallel or in series. Both, the signal detecting capacity and the intrinsic noise source of ME layered sensors depend on the volume of sensor. We have measured an equivalent magnetic noise of about 1 nT√Hz at 1 Hz and as low as 10 pT√Hz in the white noise region.

Keywords: ME sensor, ME charge coefficient, noise analyses, charge amplifier

Investigation of Strain Sensing Capabilities of Amorphous Magnetostrictive Wires Embedded in Epoxy Resin

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Abstract: In this paper we present results concerning the strain sensing capabilities of amorphous magnetostrictive wires embedded in epoxy resin. The inverse magnetostrictive effect leads to a change of permeability of wires so that applied stress can change the impedance of the amorphous wires due to the skin effect with alternating current excitation. Two different types of sensing were used, contact sensing (attachment of the wire "gauge" to a sensing devise) and induction sensing (eddy current sensing probe).

Keywords: strain sensing, magnetostrictive materials, MI effect

Magnetoelastic Viscosity Sensor for Lubricant Oil Condition Monitoring

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Abstract: Actual trends in machinery maintenance point to the necessity of an on-line real-time monitoring of the condition of the lubricant oil. Excessive delay in replacing the lubricant oil can have catastrophic results, whereas doing it too early produces evident economic and environmental issues. Magnetoelastic materials offer a good sensing principle for assessing lubricant oil viscosity; which is one of the most important properties to assure its proper lubricant capacity. Among others, one of the most remarkable properties of this sensing principle is the capability of being used through a wide viscosity range. In this work, we describe the experiments performed to evaluate the usefulness of this technology for testing the viscosity of different test oils in order to develop a working device for on-line, real-time monitoring the quality of lubricant oils.

Keywords: magnetoelasticity, viscosity sensor, on-line lubricant oil condition monitoring.

Sensitive Magnetometers

Monday, May 16

11:30 - 13:00

Magnetic Techniques for Sensitive Field Sensor Measurement

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Abstract: In this paper, we present the state of the art in sensitive magnetometers, as well as the contribution of our research group in this field. A main source of magnetic field sensors based on magnetic materials is the magnetic noise, mainly coming from the Barkhausen magnetic signals. We have tried to overcome this problem by applying rotating field in soft magnetic films and by polarizing vertically Co ultra thin films. The magnetic noise in case of the rotating magnetometers is reduced down to less than 1 pTHz-1 while the effective magnetoresistance for the vertically polarized Co films has been increased dramatically in the cost of sensitivity.

Keywords: magnetic field sensor

Low Frequency Measurements in Amorphous Wire for Studying GMI Effect

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Abstract: . When a soft ferromagnetic material is flown by an ac current and a magnetic field is applied at the same time, a major change of its impedance is occurred. The aim of this paper is to investigate the influence of low frequency (1KHz-12KHz) ac current and the applied magnetic field on an amorphous magnetic wire (Co68Fe4.35Si12.5B15) without glass coating. For this purpose an experimental configuration has been setup, based on a Wheatstone bridge which receives an ac input signal from a frequency generator. The output is connected to the amorphous wire wrapped with a coil supplied by a dc voltage for the generation of the magnetic field. The output voltage pulse is measured for two cases a) The value of ac frequency is changing while the value of dc voltage applied to the coil remains constant (the magnetic field remains unchanged) and b) the magnetic field is changing while the ac frequency remains constant to a predefined value. Experimental results of the first scenario showed that when the frequency is altered a non-linear increase of the ac signal is observed at the output which shows an increase of the GMI effect and is related to the non-linearity of the wire's permeability. For the second scenario the results showed an increase of the output signal offset (voltage) which also indicates an increase of the GMI effect.

Keywords: GMI effect, amorphous wire, magnetic materials, low frequency

Effective Control of the Magnetic Behavior of Thin Cobalt Films Deposited by MOCVD

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Abstract: Cobalt thin films were deposited by MOCVD, under various experimental conditions on Si and SiO2 substrates. The precursors used were cobalt nitrosyl tricarbonyl Co(CO)3NO, cobalt acetylacetonate Co(acac)2 and cobalt carbonyl Co2(CO)8. Emphasis was given on the delivery method of each precursor, especially to a new technique of aerosol delivery. The films were examined in terms of microstructure, surface morphology, electrical and magnetic properties. It was found that Co films deposited from Co2(CO)8 dissolved in dichloromethane were developed by a high degree of planarity and purity, while exhibiting a non-hysteretic GMR behavior in the presence of an externally applied magnetic field normal to their surface. Based on the MR effect a simple configuration useful in magnetic sensing is also proposed.

Keywords:

Magnetic Field Sensor Based on the Domain Wall Nucleation and Propagation

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Abstract: In this paper we present a magnetic field sensor based on the domain wall nucleation and propagation process in glass covered amorphous wires. The sensor utilizes the Sixtus and Tonks apparatus. A linear characteristic is reported to magnetic fields with direction opposite to the driving field, while to fields with the same direction; a monotonic, though inappropriate for sensing applications, respond is shown.

Keywords: Magnetic field sensor, Domain wall motion, amorphous wires

Applications of Magnetic Sensors

Monday, May 16

15:00 - 16:30

Device and Method of Volume Distribution Measurement and Selective Heating of Super-paramagnetic Nanoparticles

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Abstract: Device and method of volume distribution measurement and selective heating of super-paramagnetic nanoparticles inserted into a volume (V), the device modulates a casing with an inner gap, in which the subjected to scan volume (V) is inserted, and is comprised by coaxially placed arrangements, namely an Envelope Surface Determination Arrangement (ESDA) (4) of the subjected to scan volume (V), at least one Axial Magnetometry Arrangement (AMA) (3), at least one Rotating Magnetometry Arrangement (RMA) (2) and a solenoid (1). Right after the volume's (V) mapping via the ESDA (4), a series of step displacements dxi, of the solenoid (1) the AMA (3) and the RMA (2), is performed and measurements of the corresponding to every step displacement (δxi) number of SPAN via the AMA (3) and the three-dimensional magnetic field of each elementary volume (dVi) via the RMA (2), are conducted. Consequently selective heating of parts of volume (V) with measured increased distribution and density of SPAN is performed, through conducting a proper frequency current through the solenoid.

Keywords: super-paramagnetic nanoparticles

Correlation Between Barkhausen Noise and Plastic Deformation in TRIP 800 Steel Specimens

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Abstract: The aim of this study is to contribute to a better understanding of the dependence between Magnetic Barkhausen Noise and the plastic deformation of TRIP 800 steel samples. The TRIP 800 steel samples were subjected to increasing deformation by means of tensile loading and, meanwhile, Magnetic Barkhausen Noise parameters were measured (online measurements). Magnetic Barkhausen Noise parameters were, also, measured after the tensile deformation (offline measurements). The microstructure of the samples was studied by using Scanning Electron Microscopy and, finally, micro hardness and macro hardness measurements took place.

Keywords: magnetic Barkhausen Noise, TRIP 800 steel, vickers hardness, scanning electron microscopy

Use of Magnetic Techniques to Evaluate the Mechanical Properties of Duplex Stainless Steels

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Abstract: Aim of this study is the correlation among magnetic properties, tensile deformation and microstructure of the duplex stainless steel 2205. Correlation between magnetic properties of Barkhausen noise and duplex stainless steel is achieved by the magnetic ferrite phase of the two phase microstructure, ferrite and austenite. The amount of Barkhausen noise for a given material is linked with the amount of impurities, crystal dislocations, etc. and can be a good indication of mechanical properties of such a material. Specimens of the alloy DSS2205 were tested under tensile deformation in different percentages (0%, 5%. 10%, 15%, 20%, 25%). Two kinds of magnetic measurements of Barkhausen noise were taken: 1) online, during the tensile deformation and 2) offline, the prestrained specimens were measured again after deformation. The measurements of the parameters of BHN combined with the percentages of the deformations and their graphic plot showed an exponential relationship. Microstructure studied with SEM and EBSD techniques. Micro and Macro hardness also measured and their measurements compared with those of BHN. The resultant plots showed a linear proportion among them. The results are based in the basic principles of the internal mechanisms that effect dislocation - domain wall interactions.

Keywords: magnetic Barkhausen noise, duplex stainless steel, tensile deformation

Cordless Position Sensor based on the Magnetostrictive Delay Line Principle

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Abstract: In this paper a cordless position sensor based on the Magnetostrictive Delay Line principle is presented. The working principle and the response of the sensor to coaxial and parallel moving magnetic field are analyzed

Keywords: position sensor, magnetostrictive delay lines, amorphous wires

Modeling and Simulation

Monday, May 16

17:00 - 18:30

Physics and Modeling of Magnetic Non Destructive Testing Techniques

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Abstract: Magnetic Non Destructive Testing (MNDT) methods are a tool not limited in the detection of cracks and defects, like traditional NDT methods for ferrous structures, but they have shown a potential for the monitoring of the structure and crack prevention. MNDT techniques include surface Magnetic Barkhausen Noise measurements (MBN) yielding localized information about the surface stresses and magnetization processes in the vicinity of the measurement; the use of Magnetostrictive Delay Lines (MDL) for the measurement of surface stresses; the Magneto Acoustic Emission (MAE), revealing information about the magnetic domain wall propagation and indirectly about the underlying structure's role in the magnetization process of the material; magnetic major and minor loop (B-H) bulk measurements which yield information on the macroscopic magnetic properties of the material such as, the coercivity, Hc, the remanence, Br, or the permeability, μ. Results show that changes in these properties are definite signs of non-uniformly distributed stresses along the material and reveal a definitive dependence of the various magnetization reversal mechanisms such as domain wall propagation and domain rotation on the microstructure of the material, eg, the domain wall structure, the effect of dislocations, the grain size, built-in stresses. The use of modeling in forecasting is expected to greatly enhance the position of the MNDT techniques in instustrial NDT.

Keywords: magnetic NDT, Barkhausen noise, magnetic properties, microstructure, magnetization reversal mechanisms

Numerical Study of a Structure Containing Left-handed Material Waveguide

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Abstract: In this paper a waveguide structure consisting of a pair of left-handed material (LHM) and dielectric slabs inserted in vacuum is investigated theoretically. Maxwell's equations are used to determine the electric and magnetic fields of the incident waves at each layer. The boundary conditions are imposed and Snell's law is used at each layer interface to calculate the reflected and transmitted powers of the structure. Numerical results are illustrated to show the effect of many parameters on the mentioned powers under different values of refactive index of the dielectric layer. These parameters are, frequency of the incident waves, angle of incidence and LHM thickness. The frequency dependence of permittivity and permeability of the LHM is taken into account. The obtained results are in agreement with the law of conservation of energy.

Keywords: electromagnetic waves, left-handed material, frequency, transmitted power

Study and Application of Micrometric Alignment on the Prototype Girders of the CLIC two-beam Module

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Abstract: The Compact Linear Collider (CLIC), currently under study at CERN, is a Multi-TeV e+ e- collider. CLIC relies upon a novel Two-Beam acceleration concept in which the Radio Frequency (RF) power is extracted from a low energy but high-intensity particle beam, called Drive Beam (DB), and transferred to a parallel high energy accelerating particle beam, called Main Beam (MB). The particle beam acceleration is achieved with high precision RF-accelerating structures which are mounted and pre-aligned on specially developed supports, so-called girders. The length of the girder is based on the length of the CLIC Two-Beam Module, which is the smallest repetitive unit of the collider. The girders are fundamental components of the CLIC Two-Beam Module. They support and allow for active pre-alignment of the RF-structures. Pre-alignment will take place before the first beam is sent, with the aim of supplying a proper pre-alignment of the accelerator components within a few micrometers over several hundred meters. It will be performed remotely, taking into account the precision and accuracy needed and the number of RF-components to be aligned. The determination of the position of the RF-components will be performed thanks to Wire Positioning Sensors (WPS), measuring with a sub-micrometric resolution the vertical and radial offsets of their position with respect to a stretched wire considered as the reference of alignment, while the micrometric re-adjustment will be carried out by linear ac

Keywords: CLIC, two-beam Module, collider, accelerator, particle beam, support, supporting system, girder, micrometric pre-alignment, wire positioning Sensors, stretched wire, linear actuators

Modeling the Effect of Cluster Size on Sensitivity using Complex Networks

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Abstract: A theoretical investigation of the dependence of gas sensitivity of nanostructured semiconductor gas sensors on cluster size is presented. The clusters are represented as spheres and the adsorbed gas as a surface state density. The sensitivity is calculated as a change in conductivity over a change of surface state density. The results show that there is a critical cluster size, which is material dependent, at which the sensitivity is maximal.

Keywords: cluster size, complex networks

Carbon Nanotubes

Tuesday, May 17

09:30 - 11:00

Monitoring Deep Vein Thrombosis by Electrochemical Immunosensor based on His-Tag D-dimer Antibody attached to Multi walled Carbon Nanotubes

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Abstract: A biomaterial based on multiwalled carbon nanotubes (WCNTs) modified with His-tagged single chain D-dimer antibody trough Nitrilo-Triacetic-Acid (NTA) /Metal complex was designed for monitoring D-dimer as biomarker of Deep Vein Thrombosis (DVT). The immunosensing evaluation of D-Dimer was followed by the measuring redox process of such complex. Chemical modification of MWCNT allows a covalent attachment of NTA chelator containing three carboxylic groups able to coordinate metal ions Cu2+. Single chain D-Dimer antibody bearing his tag was them immobilized on the modified NTA/ Cu2+ functionalized MWCNTs. Electrochemical properties of formed layer demonstrates a reversible redox signal of complex NTA/Cu2+immobilized on MWCNTs, where the electrical properties of MWCNts promote electron transfer to electrode. The redox properties of such complex were demonstrated to be sensitive to the immuno-complex formation. The electrochemical properties of modified MWCNTs-NTA/Cu2+/SCAb were analyzed by cyclic voltammetry and differentiel pulse voltammetry to follow the redox properties of the complex after D-dimers interaction. Decrease in the redox waves related to the immuno-complex formation was demonstrated. The electrochemical biosensor based on MWCNTs/NTA/Cu2+ shows a lower detection limit of 100pg/mL and a dynamic range from 100pg to 10 µg/ml for D-dimer detection without any signal processing.

Keywords: deep vein thrombosis, D-dimer, MWCNTs, NTA/ copper, immunosensor, redox properties

Surface Enhanced Oxidation and Determination of Isothipendyl Hydrochloride at an Electrochemical Sensing Film Constructed by Multiwalled Carbon Nanotubes

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Abstract: Abstract In the present work, the electrochemical behavior of isothipendyl hydrochloride (IPH) was investigated at bare and multiwalled carbon nanotube modified glassy carbon electrode (MWCNT-GCE). IPH (55 µM) showed two oxidation peaks in Britton-Robinson (BR) buffer of pH 7.0. The oxidation process of IPH was observed to be irreversible over the pH range of 2.5-9.0. The influence of pH, scan rate and concentration of the drug on anodic peak was studied. A differential pulse voltammetric method with good precision and accuracy was developed for the determination of IPH in pure and biological fluids. The peak current was found to be linearly dependent on the concentration of IPH in the range of 1.25– 55 µM. The values of limit of detection and limit of quantification were noticed to be 0.284 and 0.949 µM, respectively.

Keywords: isothipendyl hydrochloride, antiallergic, multiwalled carbon nanotubes, voltammetric investigations, electrochemical sensor

Fabrication of Carbon Nanotube/Low Density Polyethylene Composites for Strain Sensing

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Abstract: Carbon Nanotubes (CNTs) have shown remarkable electrical, piezoresistive properties as well as other physical properties. The aim of this study is to investigate the potential of CNT-polymer composites in strain sensing using low density polyethylene (LDPE) polymer. Different CNT loadings were used (0, 1, 2, 3.5, 5, 6.5 and 8 weight %). CNT/LDPE composite films of 1mm thickness were fabricated using compression molding. The electrical resistance at no load condition was measured and the percolation behavior was obtained. The percolation threshold was found to be in the range of (2-5) wt%, where a decrease in resistivity by 5 orders of magnitude was observed. The sensitivity (gauge factor – GF) of the films was evaluated by correlating the strain applied with the simultaneously measured resistance. For a strain range of up to 320 με, a gauge factor of 200 was achieved at a CNT loading of 5 wt%.

Keywords: carbon Nanotubes, polymer composites, strain sensor, percolation threshold, electrical resistivity

Batch Welding of Aligned Carbon Nanotubes onto Metal Electrodes

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Abstract: A novel batch welding of aligned carbon nanotubes (CNTs) onto metallic electrodes is developed by radio frequency induction heating. The experiments had achieved optimum contact between CNTs and metal electrodes, two hundred samples had the same trend of reduction of contact resistance after heating process, and this reduction was irreversible, which demonstrated good reproducibility of induction heating for CNTs welding. Because of its non-contact and selective heating, induction heating provides a potential approach to reproducible large-scale fabrication and wide applications of CNTs devices.

Keywords: carbon nanotube (CNT), induction heating, welding, interconnect

Interaction of Graphene with Rhodamine 6G: A Fluorescence Quenching Study

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Abstract: Herein, R6G was used as a probe molecular to investigate the interaction mechanism between graphene and dyes by the fluorescence quenching method. The binding constants and quenching constants of graphene and R6G have been measured at different temperatures. The experimental results reveal that graphene has a strong ability to quench the intrinsic fluorescence of R6G through a dynamic quenching mechanism. The distance r between graphene and R6G was obtained according to the Förster's non-radiative energy transfer theory. It is preliminarily infered that the n-n stacking and electrostatic interactions occur between graphene and R6G, and the interactions were very weak.

Keywords: graphene, rhodamine 6G, fluorescence quenching, fluorescence resonance energy transfer

Magnetic Materials

Tuesday, May 17

11:30 - 13:00

Design and Construction Considerations in Modern MOCVD Systems: an Experimental Approach

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Abstract: Advanced features of MOCVD vertical reactors and allocated devices are reviewed to illustrate key aspects of thin film fabrication. Materials' selection criteria, critical dimensional factors and delivery of the precursor are coupled with physical properties of reactant gases in order to suggest modern and cost effective configurations. The research is based on fundamental principles of fluid mechanics, heat and mass transfer in the fluid flow regime. An optimum design of a MOCVD system for deposition of either single or multicomponent thin films by metallorganic (or organometallic) precursors is presented. An analytical model of predicting volumetric flow rates inside annular rings of reactor's entrance is also described. System's performance and efficiency are tested for the case of cobalt deposition, by using an organic solution of cobalt acetylacetonate Co(acac)2 as the precursor and a novel delivery method. As deposited Co thin films are examined in terms of microstructure and surface morphology, by means of scanning electron microscopy and atomic force microscopy. Conformal, fine-grained thin cobalt films are obtained with a negligible amount of surface roughness.

Keywords: MOCVD reactor, design, modeling, thin Films, cobalt

Growth, Structural and Mechanical Characterization and Reliability of Chemical Vapor Deposited Co and Co3O4 Thin Films as Candidate Materials for Sensing Applications

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Abstract: The adhesion and mechanical stability of thin film coatings on substrates is increasingly becoming a key issue in device reliability as magnetic and storage technology driven products demand smaller, thinner and more complex functional coatings. In the present study, chemical vapor deposited Co and Co3O4 thin films on SiO2 and Si substrates are produced, respectively. Chemical vapor deposition is the most widely used deposition technique which produces thin films well adherent to the substrate. Co and Co3O4 thin films can be used in innovative applications such as magnetic sensors, data storage devices and protective layers. The produced thin films are characterized using nanoindentation technique and their nanomechanical properties (hardness and elastic modulus) are obtained. Finally, an evaluation of the reliability of each thin film (wear analysis) is performed using the hardness to elastic modulus ratio in correlation to the ratio of irreversible work to total work for a complete loading-unloading procedure.

Keywords: chemical Vapor Deposition, Co thin films, Co3O4 thin films, nanoindentation, nanomechanical Properties

An Experimental Investigation of Magnetorheological (MR) Fluids under Quasi-Static Loadings

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Abstract: In our earlier work, test equipment has been designed, simulated and fabricated to perform experiment on MR fluids in squeeze mode. Preliminary results were gathered and presented for the purpose of validating the test equipment. Therefore, in this paper, a further systematic investigation of MR fluids in squeeze mode has been carried out. As a result, MR fluids experienced rheological changes in three stages during compression and tension. Fluid-particles separation phenomenon was the main caused for the unique behaviour of MR fluids. Particle chains depended on the structure transformation in which the carrier fluid movement can be controlled by changing the magnetic field strength.

Keywords: test equipment, magnetic simulation, magnetorheological fluids, squeeze mode

Fabrication and First Characterization of Ni2MnGa Glass-coated Microwires

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Abstract: In this paper we report on fabrication and characterization of a novel glass coated Ni2MnGa glass coated microwires with metallic nucleus diameter of 44 mkm prepared the modified Taylor-Ulitovsky method. First magnetic and structural characterization have been performed.

Keywords: glass coated microwires, Heusler alloys

A Study of the Early Stage of Ni{100-x}Fe{x} Electrodeposited Thin Films

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Abstract: The aim of this work is to understand the early stages in the growth mechanism of invar Fe100-xNiX (where X~64) alloys and also to study the influence of potential on the evolution of their crystalline structures. Invar layers were electrodeposited onto copper substrates under optimal conditions using the electrochemical method of cyclic voltammetry (CV) and chronoamperometry (CA). The influence of the potential is examined and the nucleation kinetics is discussed. In this purpose, the obtained experimental data was interpreted by applying useful theoretical methods developed by Scharifker and Hills. X-ray diffraction experiments were performed on all samples in order to follow the structural evolution of Fe100-xNiX (where X~64) layers as a function of the potential.

Keywords: electrodeposition, nickel-iron alloys, nucleation process, crystal growth, structure

Optical materials

Tuesday, May 17

15:00 - 16:30

Refractive Index Sensing based on a Fiber Bragg Grating with Micro-holes

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Abstract: A refractive index sensor based on single fiber Bragg grating with multiple micro-holes is proposed. The micro-holes are drilled by use of femtosecond laser micromachining. The key feature of the sensor is that a simultaneous and independent refractive index and temperature sensing measurement can be implemented by simply detecting the grating resonant wavelength shift and its intensity variation, respectively. The refractive index sensitivity obtained is 29.50 dB/RIU (refractive index unit), within the refractive index range between 1.30 and 1.45.

Keywords: fiber Bragg grating, femtosecond laser micromachining, refractive index sensing, temperature sensing.

Metrological Performances of Smart Structures based on Bragg Srating Sensors

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Abstract: The fiber optic Bragg grating (FBG) sensors have been recently introduced: they present a photo-record grating on the fiber itself, which allows the reflection of a certain wavelength of the input light spectrum. The applied strain is estimated based on changes of the reflected wavelength. One of the possible applications that has prompted us to study this type of sensors is the ability to create dynamometric structures based on carbon fiber: these kinds of structures are lightweight, strong and can be used, for example, in the wind tunnel where these characteristics are fundamental. The metrological characteristics of FBGs have been tested and compared to strain gages ones, which represent the actual reference measurement systems. It was decided to integrate the measurement system directly into a composite material, having achieved good results during the static and dynamic tests. We made carbon fiber specimens (two for traction and two for bending tests) with FBGs integrated into them. The results were surprising: the integration of "nude" fiber optic sensor did not cause damage or deterioration in the quality of measurement, the signal noise was maintained at baseline levels and response to dynamic stress was definitely comparable to that offered by electrical strain gauges.

Keywords: integrated FBGs, smart structures, residual strain, dynamic analysis

Metrological Performances of Fiber Bragg Grating Sensors and Comparison with Electrical Strain Gauges

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Abstract: The fiber Bragg grating sensors (FBGs) have been recently introduced: they present a photorecord grating on the fiber itself, which allows the reflection of a certain wavelength of the input light spectrum. The applied strain is estimated relying on changes of the reflected wavelength. One of the possible applications that has prompted us to study this type of sensors is the possibility to create smart dynamometric structures based on carbon fiber by embedding FBGs. Many papers are available in literature about some applications with smart structures but there is not yet an appropriate metrological characterization about these FBG sensors, their strengths and weaknesses: for these reasons it was deemed useful making several tests on FBG sensors in terms of measurement accuracy, signal to noise ratio, ability to compensate for thermal effects and their behavior for dynamic applications. All these results have been compared to electrical strain gauge ones, which represent the actual reference strain measurement systems. The various solutions to compensate for thermal effects have offered several information for further analyses and the basis for a future use of these sensors for static or semi-static tests. Being fully aware of FBGs characteristics allows to draw down guidelines about their integration in composite materials for the most different applications, understanding in a better way the sensor response.

Keywords: fiber Bragg grating sensors, smart structures, FBG metrological characterization, smart materials

Possibilities for Thick, Simple-Structure Silicon X-Ray Detectors Operated by Peltier Cooling

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Abstract: We have proposed two types of simple-structure silicon (Si) X-ray detectors with 1.5-mm-thick high-resistivity Si substrates, which are able to be operated at reasonably low negative bias and cooled by Peltier cooling. Since the device structures are simple and the detectors require only one high voltage, the cost of the X-ray detection system can be reduced very much. Moreover, the absorption of cadmium X-ray fluorescence (energy: 23.1 keV) in 1.5-mm-thick Si is approximately 65%, whereas in commercial silicon drift detectors (Si thickness: approximately 0.3 mm), it is approximately 19%. We have simulated the electric potential distribution within the proposed detectors and carried out fundamental experiments towards the realization of the detectors.

Keywords: silicon X-ray detector, simple-structure X-ray detector, thick Si substrate, high resistivity Si substrate, high sensitivity to high-energy X-rays, gated silicon drift detector.

Materials-Miscelaneous

Tuesday, May 17

17:00 - 18:30

Effect of Sintering Temperature on Microstructure and Electrical Properties of Nano Zinc Oxide Varistor

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Abstract: Nanometer-sized ZnO powder was synthesized at low decomposing temperature by polyacrylamide-gel method. Acrylamide was used as monomer, and N,N-methylenebisacrylamide was employed as lattice reagent. The characterization of powders was studied by X-ray diffraction and scanning electron microscope (SEM). The results indicated the uniform distribution of nano ZnO particles. Also electrical properties were investigated for different sintering temperatures of 800, 900 and 1000 degrees C. it was observed that with the increase in sintering temperature, the grain size of the varistor ceramics grew continuously and the increase in the nonlinear property was observed. The observed nonlinearity in current – voltage characteristic was explained by the existence of potential barrier at the grain boundaries and lowering of the barriers.

Keywords: ZnO nano particle, Varistor, grain-boundary phenomenon, non linear behaviour

Electrical Permittivity of Polyvinylidene Fluoride Nanocomposites Filled with Organoclay and Graphite Nanoplatelets: Compared and Contrasted

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Abstract: Poly(vinylidene fluoride)/graphite nanoplatelets (PVDF/GNP) and PVDF/clay nanocomposites were prepared by means of solution mixing and compression molding processes. The effects of graphite and clay nanoplatelet additions on dielectric behavior of PVDF were studied. The results showed that both clay and GNP additions were beneficial in enhancing permittivity of PVDF. However, conducting graphite platelets were more effective than nonconducting clay sheets in this aspect. This was due to the formation of mini-capacitors in the matrix of PVDF/GNP nanocomposites.

Keywords: electrical permittivity, polyvinylidene fluoride, organoclay, montmorillonite, loss tangent

Glutathione-assisted Synthesis of Hierarchical PbS via Hydrothermal Degradation and its Application in the Pesticidal Biosensing

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Abstract: Thiol biomolecule of glutathione (GSH) combined with lead ion as precursor for synthesis of hierarchical PbS via hydrothermal degradation has been developed. The precursor and as-prepared PbS were characterized by Fourier-transform infrared spectra (FTIR), X-ray diffraction (XRD), scanning electronic microscopy (SEM) and electrochemical technique. Flower-shaped micron crystals, submicron-sized spherical particles and dendritic PbS were controllably synthesized by adjusting pH value of the precursor solutions. GSH acted as both soft template and sulfur source in the synthesis. To investigate the suitability of PbS for pesticidal sensing application, an pesticidal biosensor based on the AChE-CHIT/dendritic PbS/GCE has been devised. Organophosphate pesticide dimethoate was selected as model to examine the feasibility of pesticidal bio-sensing. Under the optimum conditions, a quantitative measurement of dimethoate was achieved with the linear range of 0.05 μM to1.0 μM and the detection limit of 0.02 μM.

Keywords: L-glutathione, Lead sulfide, Hydrothermal synthesis, Acetylcholinesterase, Dimethoate, Biosensor

Ferromagnetic Shape Memory Alloys Thin Films for MEMS

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Abstract: Ferromagnetic Shape Memory Alloys (FSMAs) attract renewed interest as high performance materials for sensors and actuators. One of the most interesting features of such materials is the magnetic field induced strain (MFIS) that arises from reorientation of variants in the martensitic phase, that can reach values up to 10% in a few milliseconds. Due to their outstanding energy per mass rate, they are specially suited for applications in micro- and nanoactuation and thin films of some alloys have already been tested for such applications. Here we present results concerning the fabrication of such thin films from NiMnGa and NiFeCoGa targets by sputtering deposition. We have determined the composition change of the films as a function of deposition parameters. Curie and martensitic transformation temperatures are close but above room temperature, making these films suitable for applications.

Keywords: magnetic shape memory alloys, martensitic transformation, thin films

Poster Session

Sensitive Detection of DNA Hybridization based Quantum Dot-DNA Conjugate Probe Chip

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Abstract: We report here the preparation and application of QDs-DNA nanosensor based on bio-barcode amplification approach for rapid detection of DNA hybridization. In this study, A ligand-exchange reaction was firstly performed to prepare MPA-functionalized water-soluble QDs (MPA-QDs). Subsequently, NH2 group modified 15-mer oligonucleotides DNA were attached to the QDs surface to form functional QDs-DNA conjugates. Meanwhile AuNPs with an average diameter of 13 nm were prepared by a citrate reduction method. The modified Au NPs, target DNA (with a series of different concentrations) and hybridization buffer were thoroughly mixed and spotted onto the spotting sites on the chips to perform hybridization reaction. In order to efficiently detect DNA hybridization, a quantum dots-based bio-barcode amplification approach was employed, We show that this is possible in a format that offers low fM (10-15 M) sensitivity in the detection of KIF6 DNA, which might make the application of the proposed method possible due to the simplicity and high efficiency.

Keywords: quantum dots (QDs), bio-barcode amplification, hybridization, chip, DNA detection

Electrical Resistance Change in WO3 Nanowires Decorated with Palladium Nanoclusters by a variant of EDT to CO2 pulse

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Abstract: Tungsten trioxide (WO3) nanowires (NWs) were successfully decorated with Palladium (Pd) nanocustlers (NCs) in two steps by a variant of electroless deposition technique (ETD). The WO3 conductivity decorated with Pd NCs varies with the exposition to 4545 PPMv of a CO2 pulse introduced in an Nitrogen carrier line at 1 STD Lt/min with 0.1 STD Lt of water vapor. The electrical change is result of physical interaction between water vapor and tungsten trioxide allowing the formation of hydroxyl links, so the CO2 molecule interacts with O-H and O-W-O bonds via the electron flow from Pd NCs to carbon and from oxygen to Pd, in part by the temperature, water vapor and by O2- , O- states present in finished WO3 surface; the O-H bonding is used by CO2 molecule as an active center to fix it. Because of there is not enough energy to the CO2 insertion on Pd-O bond, the formation of any metal complex the process is not practical, so the CO2 interaction with O-H, O-W-O and O-Pd bonds makes the process entirely reversible. The sensitive to CO2 has a minimal value of 3. This as result of the absorption and desorption rate to CO2 depends on catalytic effect of palladium NCs and its derivates as are the NPs.

Keywords: Tungsten trioxide, Metal-Oxide Nanowires, decorating, Nanoparticles, CO2 detection

A Study of Magnetic Properties and Microstructure of Electrical Steels

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Abstract: Results of an experimental study of electrical steel annealed at 500, 600, 700 oC and subsequently cooled via quenching or air, are presented. The samples have been characterized with respect to their magnetic properties using Magnetic Barkhausen Noise (MBN) and major and minor loop (B-H) measurements. MBN increases with the annealing temperature in the case of the quenched samples while no significant change is noted in the case of air cooled samples. The B-H loops suggest that the prevalent magnetization reversal mechanism in the air cooled samples is domain wall propagation, while in the quenched samples 90o wall rotation seems to be significant approaching the high induction region. Scanning Electron Microscopy, on samples before the annealing, reveals a higher grain size distribution with bigger grains on the average and a significant decrease in grain size after the annealing along with a more homogeneous microstructure.

Keywords: electrical steels, Barkhausen noise, magnetic properties, microstructure, annealing

Fabrication of Porous Layer on the Nondoped Amorphous SiC Thin Film by Anodic Etching Method in HF/H2O/H2O2

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Abstract: Due to the inertness of the intrinsic (nondoped) amorphous SiC (i-aSiC) material to the chemical impact, for making it porous by the electrochemical etching method, one must use the electrolyte solution with an appropriate composition. For this purpose we have found that besides the use of solutions containing surface activation agent (Triton X-100 for example), one can use also solutions containing oxidation agent. In this report we present the results obtained with electrolyte solution in which H2O2 plays the role of oxidation agent. Results showed that with appropriate ratio of components in the HF/H2O/H2O2 solution, we can manufacture a porous layer in the i-aSiC thin film with the porosity similar to the porosity of the porous layer obtained by etching in the HF/H2O/Triton X-100 solution with optimal composition. Thin film of i-aSiC material with porous surface layer can be used in different types of sensors.

Keywords: porous amorphous SiC; thin film, electrochemical etching.

Study and Implementation of Automatic Washing Machine Control System

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Abstract: Microprocessors and sensor technology together achieved a fully automatic washing machine based on fuzzy control. System used an integrated mixed-signal system-level C8051F020 microcontroller. The system would detect and reasoning on the amount of washing objects, fabricl quality, water level, reference washing time, the flow intensity, real-time temperature and dirt level of washing liquid, so as to achieve automatically complete the whole washing process. Experiments shows that the system is stable, easy to operate, cost-effective advanced features, so that it has a certain value.

Keywords: Washing machine; automatic; SCM; fuzzy control

Information Communication Technologies: Evidence and Lessons

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Abstract: Abstract. The measurement of Information Communication Technology (ICT) investment in both nominal and volume terms is crucial for estimating the contribution of ICT to economic growth and performance. The measurement of ICT investment and relevant data are based on national accounts vary considerably across countries, especially as regards measurement of investment in software, deflators applied, breakdown by institutional sector and temporal coverage. The difficulties for measuring software investment are also linked to the ways in which software can be acquired, azs for instance via rental and licences or embedded in hardware. This paper attempts to review the most important measures of information economy and also to examine and analyze the effects from Information and Communication technologies.

Keywords: Key Words: Information Economy, Innovation Activities, Modernization, Competitiveness, Growth.

{GON-POSS}20 LBL Assembled Modified Sensor for Electrochemical Detection of 1-Hydroxypyrene

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Abstract: The negatively charged GON nanosheet allows double sided functionalization, and positively charged POSS has an inner cubic rigid inorganic core offering effective interlayer spacing, {GON-POSS}20 composite films were built up using layer-by-layer assembly based on electrostatic interaction. An electrochemical sensor consisted of graphene oxide nanoribbon (GON) - polyhedral oligomeric silsesquioxane (POSS) framework films modified electrode for preconcentrating and sensing of 1-OHP is described. When 1-OHP was preconcentrated on GON-POSS frameworks modified electrode, the response signal and adsorption stability was enhanced significantly. Differential pulse voltammetry (DPV) was used for direct determination of 1-OHP. The electrochemical sensor calibration curve had a range of 0.1 to 12.55 μM (R=0.995) with a detection limit of 0.04 μM. The results showed that the GON-POSS framework films modified electrode established a new way for simple and sensitive analysis of 1-OHP.

Keywords: {GON-POSS}20 composite films, layer-by-layer assembled, preconcentrate; sensor, 1-Hydroxypyrene

Recognition and Electrochemical Sensing of 8-Hydroxydeoxyguanosine with Molecularly Imprinted Poly(ethylene-co-vinyl alcohol)

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Abstract: The oxidative DNA damage is found that implicated in carcinogenesis and neurodegenerative diseases, and 8-hydroxy-2'-deoxyguanosine (8OHdG) is the metabolism byproduct when DNA damaged by oxidative stress. This study employed polymer processing of poly(ethylene-co-vinyl alcohol), (EVAL) to form molecularly imprinted polymers (MIPs) that recognize 8-hydroxy-2-deoxyguanosine (8OHdG). The mole ratio of ethylene to vinyl alcohol affected the performance: 32 mole % ethylene gave the highest imprinting effectiveness for guanine (G), while 27 mole % gave the highest effectiveness for 8-hydroxyguanine (8OHG). Then, 8-hydroxyguanine imprinted EVAL polymeric thin film was coated on working electrode for the sensing of 8OHdG. Adsorption isotherm parameters of 8-OHdG to 8OHG-MIP EVAL is favorable adsorption and the Langmuir adsorption equilibrium constant (Kb) and theoretical maximum adsorption capacity (Qmax) are 27.8 mL/mg and 0.007 mg/cm2, repsctively. Electrochemical measurements indicate the sensing range is 2-43 ug/mL for 8OHdG and electrical response is from 206.0± 7.8 to 865.0± 2.2 uA for the limit concentrations.

Keywords: 8-Hydroxydeoxyguanosine; Molecularly imprinting; Poly(ethylene-co-vinyl alcohol); Potentiostat sensors.

One-step Hydrothermal Synthesis of Hierarchical PbS Architectures and its Application to the Pesticidal Biosensing

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Abstract: We report a GSH-assisted one-step hydrothermal synthesis of hierarchical PbS architectures. The morphologies of the product were controlled by adjusting pH value of the precursor solution. After introduction of PbS with different morphologies on glass carbon electrode (GCE), electrochemical signal was amplified in different degrees. Furthermore, a pesticidal biosensor based on the as-synthesized PbS has also been devised. Organophosphate pesticide dimethoate was selected as model target to examine the feasibility of pesticide biosensing. Under the optimum conditions, a quantitative measurement of dimethoate was achieved with the linear range of 0.05 μM to1.0 μM and the detection limit of 0.02 μM.

Keywords: L-glutathione, lead sulfide, hydrothermal synthesis, acetylcholinesterase, dimethoate, biosensor

Metamaterial Sensor based on WGM

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Abstract: Sensor utilizing metamaterials have opened up a new field of considerable interest. We extend here the works of our group about metamaterial sensor based on Whispering Gallery Mode (WGM), which is constructed with a microring resonator sensor coated with metamaterial layer. We demonstrate that our sensor possesses higher sensitivity than the traditional sensor since the amplification and penetration of evanescent wave by metamaterials.

Keywords: metamaterials, sensor, WGM

Investigating the Impact of Research and Development Strategy on Firm Performance

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Abstract: This paper examines the influence of Research and Development (R&D) strategy on firm performance controlling for external environment. In this turbulent era, several firms build their competitive advantage on their innovation competence investing on R&D. Drawing upon a sample of 248 firms located in Greece, a structured questionnaire was developed to measure R&D strategy, external environment (dynamism, complexity, munificence, technological) and firm performance (financial, market, innovation, growth and organizational). The importance of R&D strategy in explaining the variance of all performance dimensions is confirmed with innovation performance playing a dominant role. Results indicate that R&D strategy is the most crucial antecedent of firm performance, controlling for business environment. Among environmental dimensions, only dynamism exerts statistical significant relationships. Regarding organizational size, larger firms possess a competitive advantage in the market, enjoying dominant market shares, while smaller firms exhibit supremacy regarding their innovative behavior.

Keywords: research and development strategy, manufacturing, business environment, firm performance, Greece

Detection of Formaldehyde Using Plasmonic Properties of Gold Nanoparticles

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Abstract: This paper reports a study on plasmonic properties of gold nanoparticles to detect the presence of formaldehyde solution in water. Gold nanoparticles were grown on substrates by the seed mediated growth method. A sensor system was setup, comprises a light source, a dual arm fibre optic probe, a spectrometer and sensor chamber. The detection of formaldehyde was done by comparing the Localized Surface Plasmon Resonance (LSPR) spectra of gold nanoparticles samples immersed in the deionised water and formaldehyde solution. It was observed that the peak position LSPR spectra of nanogold samples and their intensity were change by the presence formaldehyde. The difference between resonance peak intensity of LSPR spectra gold nanoparticles sample in formaldehyde solution and water can be used as sensing sensitivity parameter of the sensor. It was found that the sensing sensitivity is increase with the size of nanoparticles until it reach the optimum particles size.

Keywords: Gold nanoparticles, Formaldehyde, Plasmonic sensor, LSPR

Radiation Dosimeter based on Metal-Oxide-Semiconductor Structures Containing Silicon Nanocrystals

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Abstract: MOS structures containing silicon nanocrystals in the gate dielectric have been tested as dosimeters for ionizing radiation. Before irradiation the nanocrystals have been charged with electrons by applying a pulse to the gate electrode. The gamma-irradiation with doses in the range 0-100 Gy causes approximately linear variation of the flatband voltage, resulting in sensitivities of ~ 2.5 mV/Gy. At higher doses the sensitivity decreases because of decrease of the oxide electric field.

Keywords: MOS dosimeter, nanocrystals, metal-oxide-semiconductor structures, gamma-radiation

Improved Selectivity of Oxidized Multiwall Carbon Nanotube Network for Detection of Ethanol Vapor

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Abstract: Two kinds of Multiwall carbon nanotubes (MWCNT) networks "Buckypaper" were made by the vacuum filtration method of MWCNT aqueous suspension. The first one was prepared from pure CNT and the second from its oxidized form by acidic KMnO4 as oxidizing agent. The CNT oxidation increase content of oxygen bonded to the surface of CNT decreasing their hydrophobic character. The sensitivity of MWCNT networks to two kind of organic solvent vapors (ethanol and hepane) has been investigated by resistance measurements. The solvents had different polarities given by Hansen solubility parameters and nearly the same volume fractions of saturated vapors at the condition of experiment. CNT oxidation significantly increases the sensitivity of CNT resistive sensor to vapors of ethanol and decrease response to heptane vapors. The present paper demonstrates the effective way how to add proper selectivity for organic vapor detection.

Keywords: carbon nanotube network, sensor, Buckypaper, electrical resistance

Studies of Magnetic Properties of Amorphous Microwires Produced by Combination of by Quenching, Glass Removal and Drawing Techniques

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Abstract: In this paper we report on fabrication and characterization of nearly-zero magnetostriction Co69Fe4Cr4Si12B11 amorphous microwires produced by two different methods: i- fabricated by combination of usual Tailor-Ulitovski method allowing rapid quenching of composite glass coated microwires following by glass removal techniques (with diameter about 90 mkm); ii- produced by Tailor-Ulitovski method with consequent glass removal and warm drawing (at 300 oC). In first case the metallic nucleus diameter has been about 90 mkm and after drawing we obtained microwires with diameter about 55 mkm. Drawn samples have been annealed at temperatures between 250 and 450 oC. We studied GMI effect (dependence of impedance, Z, on applied magnetic field H) and hysteretic magnetic properties in produced microwires. Ferromagnetic magnetic without glass coating with good magnetic and mechanical properties and GMI effect have been obtained. We can tailor the microwires magnetic properties for its application in magnetic sensors through the selection of adequate thermal treatment conditions.

Keywords: glass coated microwires, giant magneto-impedance effect, soft magnetic properties

A Study of Ni{100-x}Fe{x} Alloy Thin Films Obtained by Electrodeposition

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Abstract: Ni-Fe alloys ranging in composition of Fe rich invar (Ni100-xFeX, where x ~ 64), have a variety of high technology applications due to their wide spectrum of physical properties. In this paper, the effects of the applied potential (-1.20V, -1.35V) and the bath composition (0.1M, 0.01M) of the Ni-Fe alloy thin films are studied. Ni100-xFeX layers were electrodeposited onto Copper substrates with a pH of about 2.5. The experiments were performed at room temperature and the deposition time was equal to 10mn for all deposited samples. The experiments were performed using electrochemical techniques, by means of cyclic voltammetry (CV) and chronoamperometry (CA). The morphology and elemental composition of the deposited films were studied by means of electron microscopy coupled to EDS analysis.

Keywords: cyclic voltammetry, chronoamperometry, bath composition, invar alloys, morphology

CO Sensing Properties of La1-xCaxFeO3 Perovskite Nanocrystalline Materials

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Abstract: The La1-xCaxFeO3 nanocrystalline powders were prepared by sol-gel method. These powders crystallized as perovskite orthorhombic structure. With an increase of Ca content, the resistance of La1-xCaxFeO3 sensors in air decreases at first, undergoes a minimum at x=0.3, and then increases again. La1-xCaxFeO3-based sensors show sensitive responses to CO. Among those La1-xCaxFeO3-based sensors, the sensor with x=0.2 shows the highest response to 200 ppm CO at operating temperatures below 325 degrees C. The highest response S=(RCO-Rair)/RCO for the La0.8Ca0.2FeO3 based sensor to 200 ppm CO is 87% with response time 15 s and recovery time 60 s at an operating temperature of 100 degrees C.

Keywords: Gas sensor, Carbon monoxide, Perovskite, Nanocrystalline

Gas Sensing Properties of Nanocrystalline Nd1-xCaxFeO3

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Abstract: The nanocrystalline powders Nd1-xCaxFeO3 prepared by sol-gel method crystallized as perovskite orthorhombic structure. The mean grain size of Nd1-xCaxFeO3 powders were about 15~ 40 nm. The conductivity of the Ca doped samples was enhanced, compared to that of the undoped. The Nd0.9Ca0.1FeO3-based sensor showed good gas sensing properties to ethanol and acetone. The responses of the Nd0.9Ca0.1FeO3-based sensor to 600ppm ethanol and acetone were about 158.4 at 220 degrees C and 61.7 at 240 degrees C, respectively.

Keywords: Gas sensor, Perovskite, Nanomaterials.

Polyvinylpyrrolidone Nanoparticles Encapsulated Quantum Dots: Water-Phase Synthesis and Their Use in Silver (I) Ions Detection and Live Cell Imaging

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Abstract: we report a one-pot aqueous route to encapsulate CdTe quantum dots in PVP nanoparticles. The as-synthesized PVP nanoparticle encapsulated CdTe quantum dots (PN-QDs) are highly water soluble. The fluorescence of the as-prepared PN-QDs changed from green to red and the wavelength was tunable from 539 to 606 nm. Due to the homogeneous dispersion of CdTe nanocrystals in PVP and ethylene glycol system during formation, PN-QDs with photoluminescent quantum yield can reach up to 47% and the half bandwidths wavelength of 36 nm. Based on the significant quenching effect of Ag+ ion on the fluorescence of PN-QDs, a novel method for the determination of Ag+ ion has been developed. The relative fluorescence intensity was linearly proportional to Ag+ ion concentration in the range from 2.5 to 17.5 μmol L-1 with a correlation coefficient of 0.9998. Relative standard deviation was 0.3% and the detection limit was 0.28 μmol L-1. Moreover, in vitro cellular uptake of as-synthesized PN-QDs demonstrated their potential application as fluorescent gene delivery reagent.

Keywords: Polyvinylpyrrolidone Nanoparticles; Quantum Dots; Silver (I) Ions Detection; Live Cell Imaging

PVD OF n-CuIn3Se5 Photoabsorber Films

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Abstract: Thin films of Cu-In-Se (CISe) photoabsorber with overall composition of CuIn3Se5 were deposited onto glass/ITO substrates by using physical vapour deposition (PVD) technique. Thermal conditions for the substrates during deposition process and following thermal annealing were selected with the purpose to prepare polycrystalline n-CuIn3Se5 photoabsorber layers for the hybrid photovoltaic structures based on inorganic photoabsorber and conductive polymer functional layers. It was found, that the CISe layers deposited at the temperature of substrate of 200 °C and annealed at the temperature range of 450-500 oC in vacuum and double annealed in argon and vacuum at 500 oC demonstrate high photosensitivity and photoconductivity under white light illumination of 100 mW/cm2 intensity. Obtained results show the chalcopyrite structure of prepared photoabsorber films with good adhesion to the glass/ITO substrate.

Keywords: CuIn3Se5, photoabsorber, PVD, annealing

Cyclodextrin-Based Supramolecular Multilayer Assemblies for the Design of Chemical Optical Sensors Using Tilted Fiber Bragg Gratings

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Abstract: In this work, we demonstrate the possibility to use optical fiber incorporating photowritten tilted fiber Bragg gratings (TFBG) as optical detection system for the real time monitoring of interfacial adsorption events. For this purpose, immobilization of cyclodextrin polymers onto the surface of optical fiber was envisioned through the layer-by-layer self assembly method with the aim of developing sensing layers with well-defined host properties. To verify the feasibility of our strategy, fluorescence microscopy was applied to evidence the effective inclusion of fluorescent molecular, toluene, within the cyclodextrin cavities present onto the optical fiber interface. In a further step, it was demonstrated that the elaboration of the multilayer assembly can be monitored in real time using the TFBG sensor. The host properties of the as-prepared sensing layers were directly applied to develop chemical sensor sensitive to toluene. It was found that the TFBG response was related to the toluene concentration and a linear dependence was observed in the low concentration regime

Keywords: cyclodextrin, supramolecular multilayer, titled fiber Bragg gratings, sensor, inclusion complex, toluene

Comparative study in Magnetic Composites with PMMA and PS Matrices made by Suspension Polymerization

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Abstract: Magnetic polymer composites were synthesized via suspension polymerization method, incorporating nano-Fe3O4 powder into poly(methyl methacrylate) (PMMA) and polystyrene (PS) matrices in order to obtain polymer magnetic microspheres with perspectives in sensing applications. The monomer (MMA or Styrene) and the magnetic powder (pre-made Fe3O4, 20nm in diameter) are mixed together under vigorous stirring and follows suspension polymerization. The product was sequentially filtered through a range of sieves and spherical composites were obtained with grains of sizes ranging from 45μm to 250μm. The yield of polymerization was 60% to 85% for the two different matrices in samples and the corresponding polymer product contained 1.25wt% to 4.00wt% of Fe3O4. It is observed that increasing the content of magnetite affect the surface morphology of the microspheres and their magnetic behavior. The pure nano-Fe3O4 powder and the magnetic polymer microspheres were characterized using techniques such as X-Ray powder diffraction (XRD), Fourier transform infrared spectroscopy (FTIR), scanning electron microscopy (SEM), optical microscopy and magnetization measurements carried out by a Vibrating Sample Magnetometer (VSM) .

Keywords: magnetic sensors, magnetic polymer microspheres, suspension polymerization, magnetite composites

Performance Optimization in Switched Reluctance Motor Drives

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Abstract: In this paper, switched reluctance motors (SRM) are proposed as an alternative for electric power assisted steering (EPAS) applications. A prototype machine has been developed as very attractive design for a steering electric motor, both from a cost and size perspective. A four-phase 8/6 SRM drive is designed for a rack type EPAS which should provide a maximum force of 10 kN. Two-dimension finite element analysis is used to validate the design.

Keywords: switched reluctante motor, finite element analysis

Fabrication of Cross-linked Silver Nanoparticle Imbedded SiO2 Nanofibers by Electrospinning for Surface Enhanced Raman Scattering

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Abstract: In this report, we demonstrate a method to fabricate cross-linked silver nanoparticle imbedded SiO2 nanofibres (Ag@SiO2) by electrospinning, which was used as reliable sensor substrate based on SERS detection. Since the intensity of the SERS signal depends strongly on the detailed morphology of the Ag nanostructures, it is most important to have a well-defined and well-characterized system. Electrospinning has been actively exploited as a valuable and versatile method for generating long polymer fibers with the diameter ranging from tens of nanometers to several micrometers. In this technique, SiO2 fibers are extruded from a polymer solution (containing precursor and polyvinylpolypyrrolidone) using electrostatic forces. Via carefully selecting solvents, polyvinylpolypyrrolidone and silver precursor can form homogeneous mixture solution, which can be electrospun to form composite nanofibers. A simple and versatile method that generated uniaxially aligned nanofibers over large areas by introducing a gap into the conventional collector according to the literature . The electrospinning procedures used in this study are shown in Fig. 2. These cross-linked nanofibers possess unique structural features that exhibit stronger SERS signals than single-dimensional structures, making them very appealing as Raman. Importantly, these structures created interparticle gaps for a strong SERS response.

Keywords: Silver Nanoparticle; SiO2 Nanofiber; Electrospinning; Surface Enhanced Raman Scattering

TiO2 Coating onto Fe+ Powders via Fluidized Bed CVD Reactor

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Abstract: The present essay is about coating D sized powders of Fe+ with TiO2 using a simple fluidized bed CVD reactor and as precursor TiCl4. The homemade FBCVD that was designed and built, was capable, as sown from the experimental results, to produce powders from Fe+, with TiO2 deposited onto the overall surface. The as-deposited particles, were examined in terms of crystallographic structure, microstructure, chemical composition and magnetic behavior by means of SEM, XRD, FTIR and VSM. It was realized that TiO2 deposition onto iron particles was possible using the FBCVD. Also it was observed, that the produced thin films were microcrystalline and homogenous, with the optimum conditions being in the range of 800-900 oC and a TiCl4 : air ratio equal to 1:15-1:25.

Keywords: fluidized bed, CVD, Fe+ powders, TiO2, titania, TiCl4

Determination of hardness of low-carbon mild steel with the use of Barkhausen Noise Analysis

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Abstract: In this paper we report results in the correlation between hardness and surface magnetic properties, namely magnetic Barkhausen noise (BHN) in mild steels. The correlation appears to be monotonic in materials after plastic deformation. Therefore, the BHN technique may be proposed as a method for determining surface hardness.

Keywords: mild steel magnetic Barkhausen noise surface hardness plastic deformation

Study of Thermal Behavior of Porcelain Insulators with the Finite Element Method

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Abstract: In order to study the thermal behavior of the distribution line porcelain insulators when the line's conductor current is high, a laboratory condition in a simulation program (ANSYS) was created considering the structure and geometry of porcelain insulator based on finite element analysis and working out distribution maps of temperature changes. The numerical results obtained using analytical models are in accordance with data resulting from laboratory tests carried out for this purpose. Remarkable temperature rise was not observed at insulators in spite of the high conductor temperature.

Keywords: porcelain insulators, finite element method, thermal transmission, heat flow, temperature, current, thermoelectric.

Evaluation of Wall Paint Emissivity during Infrared Thermography Temperature Measurement

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Abstract: In cases that the temperature of large surfaces needs to be measured, because measuring by conventional temperature equipment is time consuming, thermography is a fast and simple alternative solution. The most important feature that affects the amount of energy radiating from a surface, under stationary thermal conditions (fixed temperature), is its emissivity. In the present study emissivity of certain commercial wall paints was determined experimentally by adjusting its value in an infrared thermal imager, until its readings coincided with a known temperature measured by PT-100 sensors. It was shown that the emissivity is dependent on the color, current temperature and type/texture of the material.

Keywords: thermography, emissivity, temperature, radioactive waves, insulate paint

Residual Stress Prediction in Welds via the Barkhausen Noise Technique

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Abstract: The Non Destructive testing of welds is very important for industrial constructions and components. The stresses from external forces as well as the residual stresses may lead to a structure fail. The existing techniques provide solutions for measuring micrometer defects. The Barkhausen Noise (or BHN) was applied in 3 specimens of plain carbon steel St-37 with chemical composition Cl surface of the weld the probe scanned multiple cross-sections of the weld (across the weld's length), from the base metal to the weld metal and back to the base metal. The interval between the examined planes was 1 mm.

Keywords: Barkhausen noise, welding, steels

Barkhausen Frequency Response in a-Fe steels

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Abstract: The plastic deformation affects the magnetic properties of a ferromagnetic material. The differences can be detected by non-destructive magnetic testing. In the measurement system that will be described, the Barkhausen noise and the flux density induced by a sensing coil wrapped around the sample are measured. The Barkhausen effect is an irreversible change of the magnetization that is created for example by dislocations. These irreversible changes can be the result of irreversible domain walls movement by disengagement of the domain walls from the spots that prevent their movement, or if during their extension the critical value of their curvature is exceeded. The Barkhausen emissions can be also created by the discontinuous rotation of the magnetic moments in a magnetic domain, from one of the main axis to the main axis whose direction is closer to the field. The Barkhausen effect can be created by domain walls movement wherever they are 180° or non-180° walls.

Keywords: Barkhausen Frequency

Steel Hardness Measurements using Barkhausen Noise Measurements

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Abstract: The Barkhausen noise technique (BHN) has been used as a non destructive tool for the measurement of the hardness in various types of steel, namely low carbon steel, TRIP steel, Dublex steel and welding in low carbon steel. The steel samples have undergone different mechanical treatment, such as plastic deformation, cold rolling or welding. Hardness and microhardness have been determined in terms of Vickers standards. 12 hardness measurements have been obtained at the one side of each sample, in order to measure the average value and the standard deviation. Microhardness was realized in steps of 10 μm along the length of the sample corresponding to ~20 measurements. BHN measurements were realized in the same side of the samples, roughly at the same neighborhood as the hardness measurements. Figure 1 illustrates a typical dependence of the BHN on the hardness HV of TRIP steel after plastic deformation. A remarkably linear dependence of the BHN on the Vickers hardness of the corresponding samples with an uncertainty in the order of 3-5% has been achieved, illustrating that the BHN may be used as a non destructive tool for determining the Vickers hardness in steels. Furthermore, BHN measurements have obtained on the welding area, along the thermally affected zone and the weld itself, as shown in Figure 2, illustrating the expected stress field distribution around it.

Keywords: Barkhausen noise

Correlation of Structural Characteristics of Low Carbon Ferritic Steel with Magnetic Properties

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Abstract: The detail understanding of the statistical nature of magnetic properties' response and their attribution to certain structure changes in microscopic level, is essential in order to commercially exploit a reliable, high sensitivity Magnetic NDE method and fill the gap of a simple, first principles derived equation of state, which quantitatively interprets the actual magnetization data. Therefore, surface-corresponding magnetic measurements of DC field-induced magnetization were combined with other surface-sensitive techniques like MBN (Magnetic Barkhausen Noise) detection, Vicker's hardness, SEM (Scanning Electron Microscopy) and EBSD (Electron Backscattering Diffraction), in order to probe out the direct dependence of magnetic hysteresis properties from structural changes induced via cold-rolling treatment.

Keywords: carbon ferritic steel

Cold Working Degree Determination in Low Carbon Steel with Barkhausen Noise Analysis

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Abstract: Cold working is a method which results the augmentation of the strength and hardness of a metallic material (either metal or alloy), via deformation/strain of the material beyond its yield point. Cold working has a particular importance in machining of steel, when it's strained with cold treatment, meaning with plastic strain while the temperature of the steel is kept lower than the half of its melting temperature. The occurring strain results a dramatic increase in the density of the defects (linear, line and screw dislocations, displacements, point vacancies) in the interior of the crystals of the material in question. The material that was tested is a low carbon steel (mild steel) with carbon content less than 0,1%. The low carbon steel specimens (plates) were subjected to cold rolling, each one to a different degree, with the highest being -34% reduction of the original thickness of the plates. On each specimen/plate were taken 5 measurements on 3 different spots (one in the centre and 2 near the furthest edges of the side with the largest area of surface) of every side, with the use of the Barkhausen noise measurement method. In Figure 1 the correlation of the Barkhausen jumps and the hardness (in Vickers' scale) is re presented, illustrating a monotonic response.

Keywords: Barkhausen Noise

On the Mechanical Properties Determination of Armco Steel Using Magnetic Hysteresis Loop and Barkhausen Noise

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Abstract: Changes in the stress state of the material during the action of external force or after a certain mechanical history result in microstructural alterations, which can be related directly to the characteristics of the minor magnetic hysteresis loops, from the linear area of the magnetization curve, to the saturated magnetic loop. The same effect can be represented on the Barkhausen noise signal, reflecting to different states that affect the number of the irreversible magnetic events during the magnetization procedure. It is possible to correlate these changes with the degree of deformation, taking account the known initial magnetic anisotropy of the magnetic material.

Keywords: Barkhausen Noise

Acoustic Interferometry Sensor

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Abstract: This paper presents a new position sensor based on the magnetostrictive delay line (MDL) technique and the elastic microstrains generated on the MDL. These microstrains generate a voltage output across a search coil. The sensor output is a different voltage output due to the change of the position of the search coil. The position's determination is accomplished by measuring the phase of the magnetoelastic waves for different positions of the search coil.

Keywords: position sensor, magnetostrictive delay line

Virtual papers

Deactivation and Reactivation of Poly(o-aminophenol) Film Electrodes. A Study Applying Electrochemical Impedance Spectroscopy

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Abstract: Poly(o-aminophenol) (POAP) films were deactivated and then reactivated, and dependences of the different charge-transport and charge-transfer parameters on the degree of deactivation were obtained by employing Electrochemical Impedance Spectroscopy. These dependences were extracted when the polymer contacts an electroactive solution and a mediation reaction occurs at the polymer-electrolyte interface. While some parameters, such as interfacial metal-film and film-solution resistances (Rm-f, Ref-s, Rif-s), the high-frequency capacitance (CH) and the redox capacitance (Cp) exhibit a continuous variation without hysteresis between deactivation and reactivation processes within the whole μc range, others, such as electron and ion diffusion coefficients (De, Di) show not only marked changes of slope from given μc values but also hysteresis between consecutive deactivation and reactivation processes. On the basis of these findings it was considered that while some parameters of the polymer only depend on the amount of redox active sites, others (De and Di) depend on both the quantity and distribution of redox active sites.

Keywords: poly(o-aminophenol), deactivation, reactivation, charge-transport and charge-transfer parameters; mediation reaction

Effect of Substrate Temperature on Microstructural Characteristics of Thermal Sprayed Superalloys

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Abstract: Recently, there has been a huge interest in application of thermal spraying processes to apply a protective layer on the surface of engineering components. Thermal spraying as a near net shape forming technique has also found applications in manufacturing of advanced engineering components. Spraying methods such as High Velocity Oxygen Fuel (HVOF), Vacuum Plasma Spraying (VPS), and Air Plasma Spraying (APS) are among the most commonly used deposition techniques. Coatings are built up from impact of molten particles on the substrate surface and their flattening and solidification (splat formation). Deposition of millions of individual splats connected to each other at different layers will result in a lamellae type structure. This is a typical example of an anisotropic microstructure. The microstructural features such as porosity, oxide layers define the physical and mechanical properties of coating material. This study investigates the influence of substrate temperature on microstructural characteristics of APS deposited superalloy 625 on steel substrate. The coatings were deposited on substrates at different temperatures. The porosity level was measured using prosimetry. Both image analysis technique and Electron Probe Microanalysis (EPMA) was used to measure the amount of oxide phase. The results indicated that lower substrate temperature results in lower oxide in microstructure. There has been no significant change in porosity level due to substrate temperature.

Keywords: Themal Spraying, Advanced manufacturing, Supperalloy, Materials characterization

High-temperature Sensor Based on Neutron-irradiated 6H-SiC

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Abstract: Nitrogen-Doped 6H-SiC single crystals irradiated by neutron with a fluence of 5.74×1018 n/cm2 at the temperature of 60-80 degrees C were investigated by means of X-ray diffractometer and metallurgical microscope. The diffraction peak (0006) was broadened due to irradiation-induced defects resulting in the lattice distortion, and then linearly narrowed when isochronally annealed over the temperature of 700 degrees C. Chemical etching experiments showed that this behavior was accompanied by the decrease of the dislocation intensity in irradiated samples. A novel temperature sensor using 6H-SiC crystals was developed, which is based on the linear relationship between XRD FWHM (the full width at the half maximum of X-ray diffraction peak) and isochronal annealing temperature and suitable for the temperature range of 700-1300 degrees C or more. This technique can be employed as a kind of non-invasive measurement to determine the temperature of closed, high-speed rotating and difficult-to-access parts on a running machine such as internal-combustion engine pistons, turbine blades and so on.

Keywords: 6H-SiC, irradiated defects, FWHM (full width at half maximum), temperature sensor

Study on Thermal Conductive Adhesives for High-power LED Packaging

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Abstract: Direct bonded copper (DBC) as heat spreader and highly thermal conductive adhesives as thermal interface materials (TIMs), the light performances of packaged high-brightness light-emitting diodes (HB-LEDs) were tested. The results indicated that the light output power of LED modules increased with the thermal conductivities of TIMs. Apart from its low bulk thermal resistance, highly thermal conductive adhesive has high adhesion with adjacent substrates which resulted in low contact thermal resistance, then the optical performance and reliability of LED package can be improved.

Keywords: light emitting diode (LED), thermal management, thermal conductive adhesive, LED packaging, thermal resistance

Dynamic Modeling of CNC Rotary Table of Absolute Time Grating Displacement Sensor

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Abstract: To apply time grating displacement sensors with novel measurement principles to full closed-loop CNC rotary table to serve as angle detectors, it is necessary to transform temporal information to spatial information with time-space transformation algorithm for time grating sensors. After analyzing the correlation of measured data of time grating CNC rotary table with time series, mapping relation between the next future measured angle and past measured angles can be obtained with SVR. Therefore, the next future measured angle can be forecasted based on past measured angles. Then the forecast incremental angles can be transformed to continuous incremental pulses required by full closed-loop CNC system. Experiment results prove that dynamic measured displacement errors are within ±2.5%, and dynamic precise full closed-loop angular displacement measurement is realized.

Keywords: SVR, time grating; time series; full closed-loop

New Ti-alloy with Negative and Zero Thermal Expansion Coefficients

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Abstract: Most materials expand upon heating due to the anharmonicity of the atomic potential energy. This thermal expansion is one of the intrinsic properties of any material which is very difficult to be controlled. Recently, a negative thermal expansion factor was introduced to those Ti-alloys with high elastic softening when cold deformed. This negative thermal expansion factor is changeable in these types of alloys depending on the alloy composition, degree of cold deformation, and thermal history of the alloy. This change gives a lot of room to control the coefficient of thermal expansion (CTE) of those Ti-alloys to turn from positive though zero to negative values and vice versa. In this paper, the appearance of the NTE factor is discussed and the possible methods to control the final thermal expansion coefficient to achieve a zero thermal expansion coefficient are presented. The unique thermal expansion behavior of the alloys will locate them as an excellent candidate in sensing apparatus and other precious equipments.

Keywords: Ti-alloy, thermal expansion, alloy design, NTE, zero-thermal expansion coefficient, effect of plastic deformation

Using the Own Flexibility of a Climbing Robot as a Double Force Sensor

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Abstract: Force sensors are used when interaction tasks are carried out by robots in general, and by climbing robots in particular. If the mechanics and electronics systems are contained inside the own robot, the robot becomes portable without external control. Commercial force sensors cannot be used due to limited space and weight. By selecting the links material with appropriate stiffness and placing strain gauges on the structure, the own robot flexibility can be used such as force sensor. Thus, forces applied on the robot tip can be measured without additional external devices. Only gauges and small internal electronic converters are necessary. This paper illustrates the proposed algorithm to achieve these measurements. Additionally, experimental results are presented.

Keywords: Force sensor, Flexible Robot, Climbing Robot, Mechanisms

A Parametric Study of S Shape Coriolis Mass Flow Meter

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Abstract: This research work deals with a parametric study of S shape Coriolis Mass Flow meter (CMF). The influence of parameters i.e. drive frequency and sensor location on the performance of CMF is studied. Experimental results of parametric study of CMF are obtained. The CMF is calibrated for Linear relationship between mass flow rate and phase Shift as per the published research work. SOLIDWORKS software is used for the designing and LABVIEW graphical Programming Software is used for online sensing of mass flow rate.

Keywords: Coriolis Effect, Laser Sensor, S-shape, mass flow rate.

Threshold Voltage and Sub-threshold Slope Variation with Gate-length in Al2O3/InAlAs/InGaAs Quantum Well (QW) FET's

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Abstract: We have theoretically examined the scaling of the Al2O3/InAlAs/InGaAs QW FET one of the proposed III-V channel MOSFET's designed to replace the conventional SiO2/Si structures. To accomplish this we have used a Schroedinger – Poisson – Continuity equation model that is fully 2-dimentional ie all equations are solved along and perpendicular to the channel. We have found out that for the threshold voltage VT to be around zero volts a Schottky barrier ΦB of 3.5 - 4.0eV is necessary. Both Cu or W will suffice. for this. The VT value moves by 0.7 as the device is scaled from 65 nm gate length Lg to 25nm. Furthermore, as the Lg is scaled to the desired 20nm value the subthreshold slope SS increases from 90meV/dec to about 170meV/dec guaranteeing fast switching.

Keywords: Quantum well FET, Schroedinger – Poisson model, InGaAs channel

Development of an Electrochemical Maltose Biosensor

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Abstract: In this work, electrochemical maltose biosensors based on mutants of the maltose binding protein (MBP) are developed. A rutheniumII complex (RuII), which is covalently attached to MBP, serves as an electrochemical reporter of MBP conformational changes. Biosensors were made through direct attachment of RuII complex modified MBP to gold electrode surfaces. The responses of some individual mutants were evaluated using square wave voltammetry. A maltose-dependent change in Faradic current and capacitance was observed. It is therefore demonstrated that biosensors using generically this family of bacterial periplasmic binding proteins (bPBP) can be made lending themselves to facile biorecognition element preparation and low cost electrochemical transduction.

Keywords: Maltose biosensor, Faradic current

SHM System based on ANN for Aeronautical Applications

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Abstract: In the present work a Structural Health Monitoring (SHM) system based on the use of Artificial Neural Network (ANN) method is presented that is suitable for aeronautical applications. The proposed methodology can be applied for the case of stiffened panels that are typical in aeronautical structures. The effect of sensor network layout, as well as noise applied during the training and prediction phase of the ANN application, is examined.

Keywords: Structural Health Monitoring System, Artificial Neural Network, Stiffened Panel, Finite Element Analysis

Qualitative and Quantitative Architecture Characterisation of Porous Materials

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Abstract: A method for extracting accurate microstructural information from heterogeneous materials using micro Computed Tomography (μCT) is presented. A highly porous fibrous structure is used as a case study. The proposed method includes a filtering step to increase the resolution of the gray-scale slices, a local segmentation step to accurately separate the fibres from the background and a thinning procedure to simplify the structure and extract quantitative statistics such as the number of fibre joints per fibre, fibre orientation and segment length (sections between joints) distributions.

Keywords: tomography, segmentation, thinning, deconvolution, heterogeneous materials

Surface Magnon Polaritons in Enantiomeric Antiferromagnetic Structures due to Bianisotropy

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Abstract: A new class of surface magnon polaritons supported in identical enantiomeric bianisotropic antiferromagnetic structures is presented. The existence of two distinct modes with unusual dispersion and polarization properties is predicted.

Keywords: chiral antiferromagnet, bianisotropy, surface polariton, magnon.

INFORMATION TECHNOLOGY (IT) OUTSOURCING IN MARITIME COMPANIES

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Abstract: The purpose of this paper is to examine the meaning of outsourcing, referring to the high information technology (IT) field in shipping companies. This paper illustrates authors' personal experiences and knowledge, resulting out of systematic quality research in shipping companies. It analyses the basic structure of a common shipping company and the reason why companies prefer to outsource the IT field. The extremely fast pace at which information technology develops make the maritime companies to resort to external sources, with knowledge and resources, to provide their services at the mentioned field.

Keywords: Information Technology, Outsourcing, Maritime

Building the interactive relationship between the top management and the external project manager: the communication plan in a laboratory research.

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Abstract: The aim of this paper is to develop a communication management plan concerning the implementation of a high tech project with external expert as the team leader collaborating with the top management in laboratory research (business, hi-technological, financial, societal, political). The challenge of the paper is to combine through the communication process's aspect the external project manager's challenges with the interests and the expectations of the top organizational management. Our attempt tries to show how an external project manager cooperates with the top management. Management is a process that combines planning, designing, staffing, leading, organizing actions. Each project manager has to work with autonomy over the project. But at the same time he has to communicate with the top management team or person for the evaluation and the evolution of the project and the management of a certain category of problems. The communication plan helps the organization, conservation and dissemination of the communication process. It organizes how information flows, via which channels, from whom it is originated, to whom it is distributed and how often happen all these. The frequency depends on the top management's expectations but we have to keep in mind that open communication processes and lines conserves top management's commitment and involvement to the high tech project. In this paper using a communication plan we develop a simulation model that combines the elements ref

Keywords:

Outsourcing or In sourcing Decision for the Hi-tech Systems in a Maritime Company

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Abstract: The object of the current paper refers to the meaning of outsourcing and insourcing and their application on technological systems in a maritime company. When a company outsources in hi-tech field, it needs to develop an ability to specify to the external provider her own service needs in order to obtain the required results and gain the competitive advantage that the provider can offer. On the other hand, when a company decides to provide the requested services on her own, she needs to have the capability to adjust to the fast changing requirements of the hi-tech field according to her needs. In order for a company to be able to take a decision, we analyse the advantages and disadvantages of each theory and we proceeded to a quality approach of the external environment and the competition as well.

Keywords:

Selecting the project teams' members. A challenging human resources management process for laboratory research.

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Abstract: The aim of our paper is to focus on the way a project manager chooses the appropriate members of his team in order to develop a project for a laboratory research in different sectors (business, hi -technological, financial, societal, political). Project Managers are obliged to implement an organization strategy, develop new applications, work with a team and lead the right persons to the right "target". But before that Project Managers have to choose the right persons for the right job. It is very essential to take into account the positive and negative "particularities" that have those who are employed as researchers in research laboratories. Most of the times, even if project managers have the appropriate help from the human resources management department, the final decision belongs to them. In this paper we focus on the management as the dynamic functional power of an organization. In this context we examine the way selection procedures must be implemented in order to develop a team which will work on a high tech project. The selection procedure has to be part of a quality management system. People have different kind of knowledge and experience, they are motivated by different expectations and they have different skills and competencies. How do all this characteristics influence the selection procedure? Are there levels of importance? How this can influence the project team's results? In this paper we develop a simulation model focusing on the management orientation

Keywords:

MARKETING DYNAMIC SIMULATION MODELLING IN HIGH TECH LABORATORIES

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Abstract: The paper considers the role of Integrated Marketing Communication in enhancing the brand awareness of high-tech laboratories. By acknowledging the great interaction between public and private laboratories with high-tech companies, the study aimed at developing a simulation model to be incorporated in laboratories' marketing strategy. The comprehensive dynamic simulation model that was developed enlightens the emphasis that should be placed when B2B marketing activities is the matter of concern. The Marketing Dynamic Simulation Modelling is based on the principles of Integrated Marketing. It has been tested in both the private and public laboratories, concluding that marketing in the private sector receives more attention that in the public one. The proposed model incorporates all the components for successfully marketing laboratories by taking into consideration theirs budget restrictions.

Keywords: Integrated Marketing Communication, Dynamic Simulation Modelling, High-Tech Sector

PRICING STRATEGY DYNAMIC SIMULATION MODELLING WITHIN THE HIGH-TECH SECTOR

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Abstract: New product development (NPD) in the high-tech sector is a rapid paced concept that requires constant efforts and great market awareness. Pricing has received less attention by companies, even if systematic pricing monitoring may lead to severe conclusions regarding the proper allocation of resources and the segmentation of the marketplace. The purpose of the present study is to develop the concept of pricing strategies simulation modeling for the development of new high-tech products. The Pricing Simulation Model successfully represents the process that companies should carefully consider so as to employ the optimal pricing strategy.

Keywords: Pricing Strategy, High-tech product, Market Segmentation

The role of leadership in high tech manufacturing Companies in a changing environment

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Abstract: This article aims to examine the role of leadership after a change in the business environment of a company , such as a Merger and Acquisition, in high tech manufacturing companies. Particularly as the number of mergers and acquisitions (M&As) continues to increase and during recession times is one of the most common strategy, more leaders are called upon to to develop their skills an play the most important role for the company strategy. For this purpose both qualitative and quantitative methods are used to examine the effect of leadership after a Merger and Acquisition in some Greek companies that operate in manufacturing business. Findings indicate that in many cases the change that occurs as a result of a merger is imposed on the leaders who have the critical role not only to communicate effectively the company strategy but also to find the correct ways to apply the requested performance management strategies, such as recognition, innovation and others in the new company employees.

Keywords: Leadership, Performance Management , Merger & Acquisitions, High Technology business

The Performance Management after Mergers and Acquisitions in high technology manufacturing Business

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Abstract: This article aims to determine the main factors that affect the performance management strategy in high technology manufacturing Greek companies after a merger or an acquisition. For this purpose the article is based not only on the latest literature in performance management strategy, but also to interviews of executive members of manufacturing Greek companies and to the primary results of a quantitative analysis in some Greek companies that operate in manufacturing business and had in the near past a change in their environment due to a merger or acquisition. Findings indicate factors such as leadership, learning, teamwork and recognition as the ones that main affect the performance management of the company

Keywords: Performance Management, Merger & Acquisitions, High Technology business, Learning

Commensurability of the structures of boride layers

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Abstract: The interaction of solid NH4HCO3 with iron, where the ammonia product has been adsorbed nondissociatively to iron surfaces at low temperatures [1] was investigated. The nitride clusters formed on steel substrates modified the surface morphology and characteristics of the substrate and influenced their adhesion during subsequent procedure of coating. In our case, efforts were made to decorate the steel substrate in order to influence the base metal reactivity towards boron and its ability to react and form stable compounds with boron [2]. Boride layers on steel are examined by means of SEM and XRD analysis. The decorated surface was observed by FTIR method.

Keywords: commensurability, decoration, boronizing, metals and alloys, x-ray techniques

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