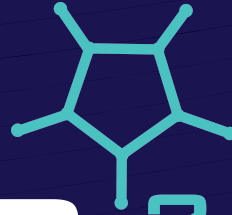




**ISTANBUL MEDENIYET
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“Innovative and Entrepreneurial”



ISSTC 2014
JANUARY 13-15

INTERNATIONAL SEMICONDUCTOR
SCIENCE & TECHNOLOGY CONFERENCE

BOOK OF ABSTRACTS

ISSTC
January 13-15 **2014**



International Semiconductor Science
&
Technology Conference



Organized and supported by

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ISSTC 2014

13.01.2014 - MONDAY		
09:00 – 10:00	Registration and Coffee	
10:00 – 10:30	Opening Ceremony Conference President – Engin BAŞARAN Honorary President – Hamit OKUR (Rector)	
10:30 – 11:15	Invited Talk – Raymond T. TUNG Quantum aspects of Schottky barrier formation	Chair: M. Saif ISLAM
11:15 – 12:00	Invited Talk – Winfried MÖNCH On the band-structure lineup at Schottky contacts and semiconductor heterostructures	
12:00– 13:20	Lunch	
13:30 – 14:00	Invited Talk – Sebahattin TÜZEMEN Developing technologies with transparent ZnO based devices	Chair: Winfried MÖNCH
14:00 – 14:30	Invited Talk – Sedat AĞAN Bionanosensors	
14:30 – 15:00	Invited Talk – M. Erkan KÖSE Experimental and Computational Studies on Optimization of Photovoltaic Activity in Organic Solar Cells	

15:00 – 15:30	Coffee Break		
	SESSION A Chair: Raşit TURAN	SESSION B Chair: Said Eren SAN	SESSION C Chair: Yavuz ONGANER
15:30 – 15:50	The illumination effects on the electric and dielectric properties of Au/ (Ni,Zn)-doped PVA/n-Si (MPS) Type Schottky Barrier Diodes (SBDs) Tuncay TUNÇ	Influence of Dodecyl Benzene Sulphonic Acid on Structural and Electrical Properties of P3HT:PCBM System Esra ALVEROĞLU	Antireflective ZnSnO/Ag bilayer source and drain electrodes for transparent ZnSnO channel-based thin film transistors Han-Ki KİM
15:50 – 16:10	GaN as an Efficient Photoanode for the Hydrogen Generation via Solar Water Splitting Mohamed EBAİD	Light Modulation by PDLc Films Ridvan KARAPINAR	Density Functional Theory SnO ₂ and TiO ₂ İsa ERDEM
16:10 – 16:30	The influence of SnO ₂ film thickness on electronic and dielectric behavior of Au/SnO ₂ /p-Si structures Fatih DUMLUDAĞ	Modeling of Dye-Sensitized Solar Cells for Characterized Devices Manufactured Using New Synthesized Organic Dyes Ahmet Nuri OZCİVAN	Influence of Sputtering Temperature on Surface Morphology of CdZnTe Thin Film Şenol KAYA
16:30 – 16:50	Temperature and Voltage Dependence Dielectric Properties and ac electrical conductivity in Au/PVC+TCNQ/p-Si structures İbrahim YÜCEDAĞ	Oxygen gas detection by electrochemically deposited ZnO Emre GÜR	Thin Film Transistors Based In Cadmium Sulfide Chalcogenide for Bendable Electronics- Samir Milad ELSARİTİ
16:50 – 17:10	Characterization of TiO ₂ /Al ₂ O ₃ Schottky Tunneling Barrier n-Channel Enhancement Mode InP MOSFET Lee Ming-KWEI	Dynamic Response Of The Graphene Gas Sensors Towards Co, H ₂ And NH ₃ Gases At Different Temperatures Behiye Boyarbay KANTAR	Phase transitions and dielectric properties of ferroelectric thin films with misfit dislocations and impurities Burç MISIRLIOĞLU
17:10 – 17:30	Electrical characteristic parameters of Pt(II)complex/p-Si contacts formed as Organic/Inorganic semiconductor structure Arife GENCER İMER	Preparation and characterization of p-type nc-a-Si:H thin film by RF magnetron sputtering Fawzy Abdel-Hamid MAHMOUD	Comparison Spray Pyrolysis and Spin Coating Technique For Doubly Doped Tin Oxide Adem KOÇYİĞİT

14.01.2014 – TUESDAY			
09:00 – 09:45	Invited Talk – Niyazi Serdar SARIÇİFTÇİ Organic and Bioorganic Semiconductor Devices		Chair: Raymond T. TUNG
09:45 – 10:30	Invited Talk – M. Saif ISLAM Integrated Nanodevices and Nanosystems		
10:30 – 11:00	Coffee Break		
11:00 – 11:45	Invited Talk – Raşit TURAN Limitations and Solutions Towards Higher Efficiency in Photovoltaic Energy Conversion		Chair: Hasan EFEOĞLU
	SESSION A Chair: Hasan EFEOĞLU	SESSION B Chair: Serap GÜNEŞ	SESSION C Chair: Yavuz BAYAM
11:50-12:10	Effects of Thermal Annealing on Ni/Au Based Schottky Contacts on n-GaN Leyla ESMER	PEG Assisted Hydrothermal Synthesis and Characterization of Co-doped ZnO DMS Nanoparticles Yuksel KOSEOGLU	Interfacing Semiconductors to Biological Structures: Challenges and Solutions Bahattin KARAGÖZOĞLU
12:10-12:30	Structural Optimization of BxGa1-xAs1-yBiy Alloy Lattice Matched to GaAs Battal Gazi YALÇIN	Sonochemically Grown ZnO Nanorods for CO Sensing Enis Ekmel TURAL	High Quality – Low Cost PENS (Percutaneous Electrical Nerve Stimulator) Designed for the Management of Chronic Pain Metin TULGAR
12:30 – 13:30	Lunch		

	SESSION A Chair: Muhammed Erkan KÖSE	SESSION B Chair: Sedat AĞAN	SESSION C Chair: Rıdvan KARAPINAR
13:40 – 14:00	Photovoltaic performance of dye-sensitized solar cells based on incorporated CNTs into Cr-doped TiO ₂ nanoparticles Mohammed Reza MOHAMMADI	Synthesis And Thermoluminescence Of Undoped And Mn-Doped ZnS Nanocrystalline Films Grown By Spray Pyrolysis Method Metin BEDİR	Bulk and Nanoscaled Organic Semiconductors Based Electronic, Optoelectronic and Electrochemical Devices Muhammad Hassan SAYYAD
14:00 – 14:20	Photovoltaic response of dye-sensitized solar cell using 2\ 7\ dichlorofluorescein as an organic dye Ibrahim Sayed YAHİA	The effects of Series resistance and interface trap on Current-Voltage (I-V) Characteristics in Au/n-Si (111) Schottky Barrier Diodes (SBDs) at Low Temperatures Mert YILDIRIM	Band structure study of GaAs _{1-x} Bix/GaAs strained structures grown by MOVPE and investigated using photorefectance measurements Mohamed Mourad HABCHİ
14:20 – 14:40	Random Multi Diode Model for Au/n-GaN Solar Cell Simulation Bengül METİN	Effect of Barrier Height Variations on SE Dopant Contrast Fatima ZAGGOUT	Optical Characterization of CdS nanoparticles embedded into the comb-type amphiphilic graft copolymer Baki HAZER
14:40 – 15:00	Operating Temperature Measurement Of Photovoltaic Modules For Performance Calculations- Ali ŞENTÜRK	Optical study of GaAsBi layers grown on GaAs substrates by metalorganic vapor phase epitaxy Hédi FITOURI	Homogenous Barrier Heigh Work On Ni/Epi-n-Si Structure Kadir EJDERHA
15:00 – 16:30	Coffee Break & Poster Session (P01 – P50)		

	SESSION A Chair: Metin BEDİR	SESSION B Chair: Mehmet BİBER	SESSION C Chair: Neşe KAVASOĞLU
16:30 – 16:50	The Influence of the Thickness of ZnO Buffer Layer on the Performance of the P3HT: PCBM Photovoltaic Cell Nevin TAŞALTIN	Termally evaporated CZTS thin films for p-CZTS/n-Si heterojunction Yusuf Selim OCAK	Time Resolved Terahertz Spectroscopy for Investigation of Charge Carrier Dynamics in Semiconductors Emine KAYA
16:50 – 17:10	Hybrid Solar Cells Using Inorganic Semiconductors And Conjugated Polymers Serap GÜNEŞ	Dielectric Characteristics of Gamma Irradiated MOS Capacitor Adem TATAROĞLU	Zn substituted nanocrystalline cobalt ferrite: electrical properties- Sinem ESİR
17:10 – 17:30	Outdoor Stability Performance Of CdTe Photovoltaic Modules Rüştü EKE	The influence of Substrate Temperature on the Structural and Electrical Characteristics of Au/p-CdTe/Al Schottky Barrier Diodes Yavuz ATASOY	A scoping study into the manufacture and use of nanomaterials in Malaysia Samir Milad ELSARİTİ

15.01.2014 – WEDNESDAY			
09:00 – 09:30	Invited Talk – Hasan EFEOĞLU Memristor in Electronics and Memristive Properties of Metal/TiO ₂ /Metal/p ⁺⁺ Si Structures		Chair: Sebahattin TÜZEMEN
09:30 – 10:00	Invited Talk – Said Eren SAN Some case studies on the employment of Liquid Crystals and nanoparticles in Organic Electronics’ applications		
10:00 – 10:30	Invited Talk – Necmi BIYIKLI Low-Temperature Plasma-enhanced Atomic Layer Deposition of Crystalline III-Nitride Thin Films		
10:30-11:00	Coffee Break		
	SESSION A Chair: Necmi BIYIKLI	SESSION B Chair: Ömer BAKKALOĞLU	SESSION C Chair: Tuncay TUNÇ
11:00-11:20	Comparison of bottom-up and top-down 3C-SiC NWFETs Konstantinos ZEKENTES	Tuning the Optical Polarization of ZnO Nanorods by an applied Hydrostatic Pressure Sotirios BASKOUTAS	Quantum noise quenching and squeezing in a two-photon laser Javaid ANWAR
11:20-11:40	The Electrical Characterization of Au/Aminopyridine/P-Si/Al Rectifying Contact With Organic Interface F. Mehmet COŞKUN	The ionic liquid based synthesis of Polyaniline–MnFe ₂ O ₄ -CTAB Ayşe DEMİR	Analysis of Leakage Current of Au/TiO ₂ /n-(4H-SiC) MIS structures using Frenkel-Poole and Schottky Emissions in Temperature Range of 200-380 K Sahar ALİALY
11:40 – 13:00	Poster Session (P51 - P95)		
13:00 – 14:00	Lunch		

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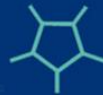


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Poster No	Abstract Title (14 th January 2014)	Presenter
P01	The Electrical Characteristics Of Nanographene Oxide Based Organic Field Effect Transistors	İBRAHİM KARTERİ
P02	Electrical properties of I-V and C-V Characteristics of The Au/n-GaAs Schottky Diodes at High Temperatures	İBRAHİM KARTERİ
P03	Electrical Parameters of a DC Sputtered Mo/n-type 6H-SiC Schottky Barrier Diode	SEZAI ASUBAY
P04	Stability of the Gel-Based Electrolyte for the Organic Rectifiers	SEVCAN TABANLI
P05	Luminescence and Carrier Dynamics of GaN/InGaN Multi-Quantum Well Coaxial Nanorods	SEUNG-MİN LEE
P06	The Electrical and Photovoltaic Effect of Co/n-GaP Schottky Diode	İKRAM ORAK
P07	A Comparative electric and dielectric properties of Al/p-Si Structures with and without doping Co Interfacial PVA Layer	AHMET KAYA
P08	The influence of Al doping on the Structural Electrical and Optical Properties of ZnO Transparent Conducting Films	SENİYE KARAKAYA
P09	Effect of Annealing Temperature on the Properties of ZnO films Prepared by Spray Pyrolysis	SENİYE KARAKAYA
P10	The current-transport mechanisms (CTMs) in Au/ppy/n-Si (MPS) type Schottky Barrier Diodes (SBDs) in the temperature range of 110-360 K	AHMET GÜMÜŞ
P11	Optical Properties of BSbxBi1-x Alloy	MEHMET ÜSTÜNDAĞ
P12	Electrical and Photovoltaic Properties of Au/(Ni,Zn)-doped PVA/n-Si Structures in the Dark and Under 250 W Illumination Intensity	ŞEMSETTİN ALTINDAL
P13	A Study on the Dielectric Relaxations In Solid State Electrolyte Systems: Nyquist & Bode Plots of Complex Capacitance	MURAT BAYHAN
P14	Oxygen Ion Conductivity and Structure Properties of Bi - Based Ternary System	YASİN POLAT
P15	The interface state density distribution from capacitance and conductance-frequency characteristics of Au/p-Si Schottky device with perylene-diimide interlayer	NİHAT TUĞLUOĞLU
P16	Dielectric and ac conductivity properties of perylene-monoimide layer prepared by using spin coating method on n-type Si (100) substrate	NİHAT TUĞLUOĞLU
P17	Effect of isothermal annealing time on ac conductivity and dielectric properties of Au/n-Si Schottky diode with SnO2 interlayer	SERDAR KARADENİZ
P18	Effect of isothermal annealing time on electrical properties of Schottky diodes based on tin oxide film prepared by spin coating technique	SERDAR KARADENİZ
P19	The Production of Magnetic Nanoparticles and Study their Effect on the Properties of Carbon Nanotubes	MOHAMMAD HASSAN RAMEZAN ZADEH
P20	The effect of tunneling enhanced recombination current on interface state density for Graphene/a-Si:H structure	ABDÜLKADİR SERTAP KAVASOĞLU
P21	Simulation programme about barrier height inhomogeneity effect for Au/n-GaN device	NESE KAVASOĞLU
P22	Preparation and Characterization of Li doped and undoped ZnO thin films by spin-coating technique	MEHMET YILMAZ
P23	High transparent and low resistance ITO thin film on PET sheet grown by ionized physical vapor deposition technique	KYUNG-HYUN KİM
P24	Effect of Washing in Ethanol of Porous Silicon on Efficiency of Porous Silicon Based Fuel Cells	SUREYYA AYDIN YUKSEL
P25	Illumination intensity effects on the dielectric properties of Schottky Devices with	İLBİLGE DÖKME
P26	Structural, Optical and Electrical Properties of Cd1-xCoxS Thin Films Prepared by Chemical Bath Deposition Method	YILMAZ ONCEL
P27	Interactions Between Coumarin 151 and Colloidal CdS Semiconductor Particles in Aqueous Solution	YAVUZ ONGANER
P28	An Organic-Inorganic Rectifying Contact Based on a ZnPc Derivative	ENİSE OZERDEN
P29	UV LIGHT ACTIVATED GAS SENSOR FOR NO2 DEDECTION	IRMAK KARADUMAN
P30	Determination of K α X-ray Production Cross Sections and K β /K α Intensity Ratios for Ba, La, Ce and Gd Elements Excited with Photons of 0,0208 Nanometer Wavelengths	FERDİ AKMAN
P31	The LIII Subshell X-ray Production Cross Sections of Yb, Hf, Ta and W elements at Photons of 0,0208 Nanometer Wavelength	MEHMET TURHAN
P32	SiC GAS SENSOR FOR NO2 DEDECTION	METİN ÖZER
P33	Investigation of current-voltage-temperature characteristics in Al/p-Si Schottky diode with the polythiophene-SiO2 nanocomposite interfacial layer	DURMUS ALİ ALDEMİR
P34	Optical properties of Cd(OH)2 thin film synthesized using the arc discharge method	ÜMMÜHAN AKIN
P35	On The Current-Voltage Characteristics Of Au/n-InP/In Diode At Low Temperature	TUBA ÇAKICI
P36	The Effects Of Thermal Annealing On The Current-Voltage Characteristics Of Au/n-InP/In Diode	TUBA ÇAKICI
P37	Fabrication and Electrical Characterization of Au/Pyronine-G/p-Si Diode	SONGUL DUMAN
P38	Characterization of SnS Thin Films Grown by SILAR Method	YUNUS AKALTUN
P39	The effect of cadmium concentration on structural, optical and dielectric properties of CdxZn1-xO thin films	MEMET ALİ YILDIRIM
P40	Synthesis and Characterization of Na-doped CdS Films	AHMET BEDİR
P41	Preparation and Polymerization of Chalcone Substituted Aniline and Investigation of Electro-optical Properties	ESMA AHLATCIOĞLU
P42	Newly emerging simulation and experimental investigations for surface characterization with desorption electrospray ionization mass spectrometry	MURAT YILDIRIM
P43	Electrical properties of Al/CZTSe nanocrystal Schottky diode	Ö. FARUK YÜKSEL
P44	Deep defects study in CIGSe based thin film solar cells by DLTS spectra in different metastable conditions	ADEM DÖNMEZ
P45	Effect of F-doping on structural, electrical and optical properties of NiO thin films	SÜLEYMAN KERLİ
P46	Detection of mismatched NRAS gene using fluorescence quenching	JONG SUNG KİM
P47	Capacitance-Voltage characteristics of Ni/Au/n-GaN contacts	İKRAM ORAK
P48	Pulsed DC sputtered Cr/p-InP Schottky barrier diodes	TAHSİN KİLİCOĞLU
P49	Effects of the radiation on Al/organic film/p-Silicon semiconductor diode	OMER GULLU
P50	Temperature dependent electrical characterization of a metal/semiconductor contact with an organic dye interlayer	KEMAL AKKİLİC

Poster No	Abstract Title (15 th January 2014)	Presenter
P51	Electrochromic behaviour of WO ₃ and MoO ₃ mixed structures	TUBA KILINC
P52	The interface states and series resistance effects on Current-Voltage (I-V) Characteristics of Au/P3HT/n-Si Schottky Barrier Diodes (SBDs) at Room Temperature	ESRA YÜKSELTÜRK
P53	The Comparison of Electrochromic Properties of Structures NiO and WO ₃	TUBA KILINC
P54	Suitibility of Inkjet Printed OTFTs for Logical Circuits	ÖZCAN BİRGİ
P55	Effects of stabilizer amount on the properties of sol-gel grown Cu ₂ ZnSnS ₄ films	SÜLEYMAN KAHRAMAN
P56	AN EXPERIMENTAL INVESTIGATION OF CURRENT VOLTAGE PROPERTIES OF AlGaInP/GaInP UNDER MAGNETIC FIELD AT ROOM TEMPERATURE	GORKEM OYLUMLUOĞLU
P57	Metal-Thickness Dependence on the Electrical Properties Of Ideal Ti/n-GaAs Schottky Contacts	TUNA GÖKSU
P58	Effect of copper amount in starting composition on structure and morphology of CZTS thin films prepared by sol-gel spin coating	SAMED ÇETİNKAYA
P59	Investigation of Light Response of Ag/p-Si/Ag Diode Produced in Room Conditions	ATILLA EREN MAMUK
P60	Leakage current by Frenkel-Poole emission on Benzotriazole and Benzothiadiazole Based Organic Devices	DİLBER ESRA YILDIZ
P61	Effect of thickness on the electrical and optical properties of organic solar cell	DİLBER ESRA YILDIZ
P62	Study the effect of reactor temperature and precursors positions on the optical band gap of SnO ₂ thin films prepared by APCVD	MOHAMMAD REZA BENAM
P63	Temperature Dependence of Electrical Characteristics of Ag/n-GaAs Schottky Barrier Diodes	SERTAN KEMAL AKAY
P64	THE EFFECTS OF HIGH ENERGY ELECTRON IRRADIATION ON AU/N-GAP SCHOTTKY DEVICES	KÜBRA ÇINAR
P65	Nickel Doping Effect on Some Physical Properties of Sol-gel	ERDAL SÖNMEZ
P66	Nanocrystalline thin films of AgS grown by spray pyrolysis	AHMET TAŞER
P67	Characterization Antimony and Fluorine Doped Tin Oxide Thin Films with XRD, SEM and FTIR Dependent on Substrate Temperatures	AHMET BATTAL
P68	Analysis of current-voltage-temperature (I-V-T) and capacitance-voltage-temperature (C-V-T) characteristics of Ti/p-Si Schottky structures	HATİCE ASİL
P69	Point Defect Investigation of AlInN Hemt Structure	ERKAN HEKİN
P70	Effect of different spin speed on structural and physical properties of doubly doped tin oxide thin films prepared by spin coating method	AHMET BATTAL
P71	Detailed experimental studies on influence of intrinsic material properties on photoresponsive organic field-effect transistors (PhotoFETs).	Z.A. KÖSEMEN
P72	Simple Fabrication of Cr functionalized ZnO nanorods and Investigation of Electrical Properties	SADULLAH ÖZTÜRK
P73	Solar Cell Application of Sputtered Au/Ti/ Al ₂ O ₃ /N-GaAs Schottky Diodes With Interfacial Layer of Al ₂ O ₃	ABDULKERİM KARABULUT
P74	Preparation of poly (N-vinyl carbazole)-co-poly(2-(Dimethylamino)ethyl methacrylate) based hydrogen bonded side-chain liquid crystal copolymer	ESMA AHLATCIOĞLU
P75	Highly Ordered Titanium Dioxide Nanotube Arrays: Fabrication	ERDEM ŞENNIK
P76	Zinc stannate/Graphene oxide hybrid material and its photoca	HASAN YOLCU
P77	Corrosion behaviour of electrochemically deposited ZnMn	ÖMER F. BAKKALOĞLU
P78	INVESTIGATION OF THE EFFECT OF GAMMA AND UV RADIATION	UĞUR ADNAN SEVİL
P79	Investigation of some optical and structural parameters of MnO and boron doped MnO films growth by spray pyrolysis technique	METİN BEDİR
P80	Photocatalytic activities Ag/ZnO, Au/ZnO and Pd/ZnO doped by borohydride reduction method	NURAY GÜY
P81	Characterization of Indium selenide thin films prepared by thermal evaporation for Cu(In,Ga)Se ₂ /In ₂ Se ₃ /ZnO:Al solar cells	ABDESSELAM BOULOUPA
P82	Self-consistent analysis of the band structure of doped lattice-matched GaNAsBi based-QWs operating at 1.55 micron	MOHAMED MOURAD HABCHI
P83	Modeling of Sub-Bande Effect in Carrier Concentration of CNTFET	ABDELMALEK MOUATSI
P84	Analytical calculation and comparison of numerical solutions obtained by the technique of the transfer matrix of the transmission and reflection of metamaterials	CHOUAÏB CHETTAH
P85	Metalorganic vapor phase epitaxy growth of GaAsBi/GaAs heterostructures	HÉDİ FITOURI
P86	Properties of Co-doped ZnO thin films grown by pulsed laser deposition on glass substrates	ADEL TAABOUCHE
P87	The Characteristic Properties of Se Doped CuGa Thin Films	NİLGUN BAYDOĞAN/
P88	Effect of pH on the Physical Properties of CIGS Thin Films	NİLGUN BAYDOĞAN
P89	Antireflective ZnSnO/Ag bilayer source and drain electrodes for transparent ZnSnO channel-based thin film transistors	HAN-Kİ KİM
P90	THE ELECTRICAL CHARACTERIZATION of Au/ F ₃ O ₄ /p-Si/Al RECTIFYING CONTACT WITH F ₃ O ₄ INTERFACE	ALİ RIZA DENİZ
P91	CURRENT-VOLTAGE (I-V) CHARACTERISTICS OF Sn/GaTe/p-Si/Al RECTIFYING CONTACTS	ZAKİR ÇALDIRAN
P92	Modification of Cellulose Acetate nanofibers with PVP/Ag addition	SOUAD KENDOULI
P93	Novel combination of layers buffer / window (Zn _{0.80} V _{0.20} O/Zn _{0.99} V _{0.01} O) for CIGS solar cells	KAHINA MEDJNOUN
P94	Effective Atomic Number Determination of Some Amino acids by Scattering Intensity Ratios of 0.0208 Nanometer Wavelengths Photons	AHMET TURŞUCU
P95	Al/Ligand(N-APTH) and Al/Cu(II)Complex Organic/Inorganic Contacts	CABİR TEMİRCİ
P96	A comparative study on the electrical characteristics of Au/n-type 4H-SiC Schottky barrier diodes (SBDs) with and without TiO ₂ interfacial insulator layer	GÖKÇEN ÇETİNKAYA
P97	Electrical Characterization of Ni/Al _{0.09} Ga _{0.91} N Schottky Barrier Diodes as a Function of Temperature	LEYLA ESME
P98	First-principles investigation of Mn doped ZnS semiconductor by applying a computational method	RACHIDA NOURI
P99	Comparison between Zinc Oxide Coatings on Glass Produced by Silar And Sol-Gel Methods	MUTLU KUNDAKÇI
P100	Current-Voltage-Temperature (I-V-T) Characteristics of Au/V-doped PVC+TCNQ/p-Si structures	ÖMER SEVGİLİ
P101	Production of PMMA via living polymerization with ATRP method	TAYFUN BEL



INVITED TALKS

Quantum Aspects of Schottky Barrier Formation[#]

Raymond T. Tung

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The formation of the Schottky barrier height (SBH) is a complex problem because of the dependence of the SBH on the atomic structure of the metal-semiconductor (MS) interfaces, repeatedly demonstrated by careful experimental and theoretical studies. Traditional models of the SBH largely assume that the formation of interface dipole is a “Fermi level phenomenon”, namely, it arises from charge transfer near the Fermi level, and are unable to explain the rich chemistry exhibited at MS interfaces. In this presentation, we discuss the formation of electronic states in the MS region from quantum-mechanical perspective and show that the “charge transfer” at the interface actually takes place over a wide energy range. Results of *ab initio* calculations of epitaxial MS interfaces, available in the literature, will be analyzed to highlight some general aspects of the charge transfer and the connection with the formation of chemical bonds at the MS interface. The rigorous quantum-mechanics-based picture of SBH formation however provides no simple equations that are applicable for all MS interfaces. To semi-quantitatively understand the experimental and theoretical SBHs of real MS interfaces, one therefore resorts to chemical concepts and principles that govern the transfer of charge associated with molecular bonds. Results from several successful chemical approaches, with varied degree of sophistication, in the estimation of the interface dipole are described. In addition, some important aspects of current transport at inhomogeneous SBH are discussed.

[#] Talk dedicated to the memories of Samil Emre Ogun

On the band-structure lineup at Schottky contacts and semiconductor heterostructures

Winfried Mönch

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The band-structure lineup at semiconductor interfaces is explained by the intrinsic interface-induced gap states (IFIGS) that derive from the complex band structures of the semiconductors. Hence, the barrier heights of metal-semiconductor or Schottky contacts as well as the band-edge offsets of semiconductor heterostructures are composed of a zero-charge-transfer plus an electrostatic-dipole term which are determined by the branch-point energies of the semiconductors and the electronegativity difference of the two materials in contact, respectively. This IFIGS-and-electronegativity concept will be illustrated by experimental core-level shifts induced by metal adatom on group-IV semiconductor surfaces and by barrier heights and valence-band offsets of Si and SiO₂ Schottky contacts and heterostructures, respectively.

Developing technologies with transparent ZnO based devices

Sebahattin Tüzemen

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Recent developments in transparent wide bandgap material ZnO in terms of growth, characterization and application have shown that the material is a strong candidate for the development of new technologies such as light emitting diodes (LEDs), photo-diodes, gas sensors and solar cells. As far as the LEDs are concerned, it has been shown that high color temperature white LEDs can be produced from both homo- and hetero-junction p-n structures. Stimulated light emission has been observed due to the multiple reflections from the ZnO/ZnO and ZnO/GaAs interfaces. These devices have also been shown to be efficient for photo-diodes. On the other hand, electrochemically deposited ZnO thin films on InSe:Ho layers are quite useful in terms of response, sensitivity and recovery times especially for O₂ sensors, due to their high surface reactivity. Furthermore, one dimensional (1D) dye sensitized nano-wire and nanoporous solar cells are shown to exhibit very high solar conversion efficiency and high incident photon current efficiency.

Nano-Biosensors

Sedat Ağan

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In this work, the subject of developing nano-biosensors for protein detection by new materials and techniques is investigated. The vertical capacitor sensors were designed and gold and chrome materials were used in metal plating. SiO_2 and Al_2O_3 materials were used as dielectric materials between the plates of metals. Fabrication of capacitive nano-biosensors with nano gap and characterization at low frequency ranges (1 kHz – 100 kHz) were investigated. With unlabelled capacitive nano-biosensors developed detection of streptavidin proteins in 100 $\mu\text{g/ml}$, 10 $\mu\text{g/ml}$, 1 $\mu\text{g/ml}$, 100 ng/ml and 10 ng/ml concentrations were investigated. In addition, the effect of structures of different sensor geometrical shapes on the sensitivity of detection, the relationship of wet etching time with the sensitivity of detection and the duration for binding of streptavidins to functionalized surfaces were investigated as well. The repeatability, stability and reliability tests of nano-biosensors produced were performed and its reliability was proved. Also, we are investigating of bacteria detection nano-biosensors.

Experimental and Computational Studies on Optimization of Photovoltaic Activity in Organic Solar Cells

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Organic photovoltaics offer the use of organic conjugated systems as an alternative to silicon and other inorganic materials. Easy processing conditions as well as deposition on flexible substrates make organic materials attractive in photovoltaic technology. The latest organic photovoltaic devices with novel sun-light absorbing materials have yielded power conversion efficiencies exceeding 11% under solar illumination. It is clear that new donors and/or acceptors are required in order to reach high efficiencies needed for commercialization of OPV technology. The goal here is to utilize novel donor materials with donor optical band-gaps around 1.5 eV or less for more efficient sun-light harvesting that would yield high power conversion efficiencies in organic solar cells. Synthesis of a low band-gap material is just one of the parameters that should be optimized among the other factors such as carrier transport and recombination, exciton diffusion, and bulk morphology. In this talk, an overview of current developments in OPV research and recent research results in our laboratories will be provided. A set of star-shaped molecules with benzothiadiazole and benzoxadiazole groups in the arms were designed and synthesized as a low band gap material for use in organic photovoltaic devices. The effect of structural variation on carrier mobility and device efficiency will be discussed. The photovoltaic properties of four donor-acceptor polymers utilizing thieno[3,4-c]pyrrole-4,6-dione (TPD) as acceptor comonomer will also be introduced. Last but not least, an experimental methodology will be introduced for accurate measurement of exciton diffusion length in conjugated materials along with related simulations and calculations.

Organic and Bio-organic Semiconductors for Organic Electronics

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Organic electronics such as organic light-emitting diodes (OLEDs) are newcomers on the market, but already are being produced and sold in the scale of tens of millions of display units per month, primarily for smartphones and HDTVs. The recent demand for OLED technology is projected to increase, particularly as OLEDs are able to provide lightweight, thin, foldable, and transparent display products. The success of OLEDs paves the way for emergence of related technologies such as organic photovoltaics (OPV) and organic field-effect transistors (OFETs) and circuits. Several companies (Mitsubishi Chemicals, Solarmer Inc., Heliatek) and university research groups have demonstrated flexible plastic OPVs with power conversion efficiencies exceeding 10%, making OPV a potential competitor in the solar photovoltaics. Considering the state-of-the-art of organic electronics and novel ideas related to it, we anticipate that organic electronics will constitute a significant part of consumer electronics in the future.

We are moving from consumer electronics to consumable electronics.

With problems of electronic waste being a serious environmental issue today, using biodegradable materials for organic electronics is important ansatz.

This talk will present some of the initial steps taken to address this issue of bio-organic, biodegradable organic semiconductor devices. Many materials have been shown to be biodegradable, safe, and nontoxic, including compounds of natural or nature-inspired origin. Additionally, such organic materials are used for bio-functionality in electronic circuits.

Peeling Atoms by Quantum Nanostructures with Controlled Surface Disorders: Highly Selective Bio-Chemical Sensing and Cost-effective Pollution Control

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Ultra-sharp nanostructures exhibit important functionalities in devices including gas ionization sensors, field emission devices, ion-mobility spectrometry, electrostatic precipitators and biological, chemical and agricultural sensors. We will present examples of engineered 1D semiconductor nanostructures in ultra-selective sensors and discuss their importance in chemical and biological detection; diagnosing medical symptoms of certain diseases; monitoring and controlling agricultural and industrial green house gas emission, indoor air quality of homes, public places, manufacturing plants, automotive emission, waste disposal and treatment plants. We will also show how such devices can dramatically reduce the design complexities of pollution monitoring and controlling systems. A sensor based on charged gas particle beams, for which the geometrical and surface properties of the constituent semiconductor nanotips are engineered with controlled introduction of atomic metal impurities and surface disorders to realize more than three orders of magnitude reduction in the electric-field strength for gas ionization will be presented. An advantageous combination of field enhancement on nanoscale tips, surface states introduced by defects, along with controlled impurities and bandgap widening through quantum confinement contributes to such lowering of ionization electric-field strength. These structures belong to a new class of devices that capitalizes on the notion that nanostructures offers great potential to be rationally tailored in a myriad of useful ways for accurate fingerprinting a broad range of biological and chemical analytes and for cost-effective control of environmental pollution.

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Limitations and Solutions towards Higher Efficiency in Photovoltaic Energy Conversion

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Photovoltaic technologies based on crystalline Si solar cell technology have gained an extremely well maturity level with well-optimized material and process conditions. Further improvements in the cell efficiency and the cost should be based on new and exotic approaches searching for solutions to overcome the limitations. Among such efforts, new device concepts based on quantum nanodots, tandem structures, light managements approaches can be mentioned. Recently, light trapping studies are attracting special attention due to the potential improvements both in the cell efficiency and material cost. Light trapping techniques aim at increasing the path length and the number of scattering events of the incident photons, thereby increasing the light absorption. Both reflection and transmission through the cell are significantly reduced in this way. Traditionally, surface texturing and anti reflection coatings have been commonly used for this purpose. Alternatively, Si nanostructures are being extensively studied for light trapping applications in crystalline and thin film solar cell systems. Si nanowires can be formed as vertically aligned and integrated arrays on the surface, which was found to bring remarkable light trapping strength.

In this presentation, after an introduction to photovoltaic devices and related technologies, I will summarize the new approaches for high efficiency photovoltaic solar cells based on new material systems. Particularly, cell concepts with tandem Si dots will be emphasized. Our recent results on the fabrication of new material type called Si nanosponge will be presented. We have optimized the optical, electrical and structural properties of Si nanosponge for photovoltaic applications. Also I will present our work on Si nanowires that have been fabricated over large areas using metal assisted etching (MAE) method, which involves etching of silicon wafers in a silver nitrate and hydrofluoric acid based solution. After a detailed parametric study, they were applied to industrial size (156 mm x 156 mm) solar cells. The reflectivity of the device surface was reduced to almost zero for the whole visible spectrum including the blue-violet region. This has blackened the cell's surface completely. Standard solar cell fabrication procedures have been followed to produce cells with and without nanowires. It is found that the metallization needs a special attention due to poor contacting on nanowires.

Memristor in Electronics and Memristive Properties of Metal/TiO₂/Metal/p⁺⁺Si Structures

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New emerging memristor is getting much attention due to its potential application in electronics. Memories may be the first potential application of memristor for high speed and dense data storage which is beyond today's limit. The memristive behavior of metal/metaloxide/metal structures are modeled with filament formation, voltage driven oxygen vacancies and Poole Frenkel emission from the electronic states. Memristive behavior of TiO₂ is well explained by oxygen driven vacancies but in some cases its behavior may be explained by the other mechanisms. The well known and the first memristor is based on TiO₂ film having thickness at nm scale. Growth rate of TiO₂ is very sensitive to base pressure and high quality films only can be grown near to forbidden region (may be called poisoning region). TiO₂ thin films in this study fabricated using reactive RF sputtering with 20ccm Ar(6N) and 0.46ccm O₂(6N). A sequential sputter is used for 10nm Pt or Ti film on p⁺⁺Si and then 10nm TiO₂ is grown with 0.03-0.02 A/sec rate. Top Pt metallization has been done onto TiO₂ using lift-off technique or Al metallization using vacuum deposition and shadow mask. I-V(t), R(t)I measurements were carried out using Keithley 2400 with current or voltage compliance using a software dedicated for memristor characterization. Voltage scanning rate was changed from 0.5V/sec to 0.001V/sec. A gradual switching rather than abrupt switching between ON and OFF states were observed during the continuous cycling. Due to initial condition of samples or possible minor differences between growth processes as voltage cycling proceeded resistance of some structures under the test are increased to 1012 Ohm or decreased below to a few kOhm level. On the other hand, in high resistance case is not very stable. By the time much lower resistance occurred but when cycling repeated later, the resistance goes up again. This observation indicates trapping and detrapping of electronic states may control the resistance. This process is to be activated by kT energy or carriers driven by built in electrical field at the interface.

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Some case studies on the employment of Liquid Crystals, Conducting Polymers and Nanoparticles in Organic Electronics' applications

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Liquid Crystals (LC) are highly nonlinear optical materials and they are sensitive against optical, electrical and magnetic fields. This sensitivity could be exploited for various device designs. In the scope of this presentation, I will firstly discuss the diffraction grating experiments, which are indeed base experiments for Holographic data storage and principally information could be stored at the order of Terabyte per cubic centimeter via this approach. Actually it was experimentally observed and shown that dye and Carbon nanoparticles doped LCs are promising candidates as storage mediums via Holography.

Second case study is devoted to another critical experimental demonstration that proves the reorientation and conservation of Carbon Nanotubes (CNT) in the structure of nematic LC. Experimental concepts propose this CNT reorientation, which is of critical importance for potential CNT applications, via electrical, optical and magnetic fields.

Third case study is a Hybrid Solar Cell, which is designed and proposed as a feasible and reasonable alternative, according to acquired efficiency with the employment of zinc oxide (ZnO) nanorods and ZnO thin films at the same time. Both of these ZnO structures were grown electrochemically and poly(3-hexylthiophene) : phenyl-C61-butyric acid methyl ester; (P3HT: PCBM) was used as an active polymer blend, which was found to be compatible to prepared Indium-Tin-Oxide (ITO) substrate base. This ITO base was introduced with mentioned ZnO structure in such a way that, the most efficient configuration was optimized to be ITO/ZnO film/ ZnO nanorod/ P3HT: PCBM/Ag. Efficiency of this optimized device is found to be 2.44 %. All ZnO works were carried out electrochemically, that is indeed for the first time and at relatively lower temperatures.

Forth one is an Organic Field Effect Transistor (OFET) device, which was prepared by a side chain thiophene based-dielectric gel copolymer and it shows a higher field-effect mobility and lower threshold voltage. The device is a sandwich type and promising results could be attributed to the compatibility that comes from the similarity between the chemical structures of semiconductor and dielectric layers due to π - π interactions caused by intermolecular overlapping of p orbitals in aromatic thiophene groups existing in both layers. This proposed device which was prepared with poly(MMA-co-MTM) has a field-effect mobility of $0.57 \text{ cm}^2/\text{Vs}$, a threshold voltage of -0.20 V , on/off current ratio of 103 while the device prepared with just PMMA has a field-effect mobility of $0.38 \text{ cm}^2/\text{Vs}$, a threshold voltage of -0.26 V and on/off current ratio of 102.

Low-Temperature Plasma-enhanced Atomic Layer Deposition of Crystalline III-Nitride Thin Films

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Plasma-enhanced atomic layer deposition (PEALD) of crystalline III-Nitride thin films including AlN, GaN, and InN are demonstrated. Depositions were carried out at 200 °C using organometallic precursors and NH₃ or N₂/H₂ plasma. GIXRD patterns indicated polycrystalline thin films with wurtzite crystal structure. PEALD parameters were optimized for AlN and GaN thin films using N₂/H₂ plasma. Ellipsometric spectra of the samples were modeled using the Cauchy dispersion function, from which the refractive indices of 59.2-nm-thick AlN and 20.1-nm-thick GaN thin films were determined as 1.94 and 2.17 at 632 nm, respectively. Spectral transmission measurements of AlN, GaN and Al_xGa_{1-x}N thin films grown on double side polished sapphire substrates revealed near-ideal visible transparency with minimal absorption. Optical band edge values of the Al_xGa_{1-x}N films shifted to lower wavelengths with the increasing Al content, indicating the tunability of band edge values with alloy composition.

ORAL PRESENTATIONS

SESSION A

The illumination effects on the electric and dielectric properties of Au/ (Ni,Zn)-doped PVA/n-Si (MPS) Type Schottky Barrier Diodes (SBDs)

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Illumination effects on electric and dielectric properties of Au/(Ni,Zn)-doped polyvinyl alcohol/n-Si have been investigated as function of illumination intensity by 50 W steps at 1 MHz in the voltage range of (-4)-(+5) V. Before and after illumination; the real and imaginary parts of dielectric constant (ϵ' , ϵ'') and electric modulus (M' , M''), loss tangent ($\tan\delta$), ac electrical conductivity (σ_{ac}) were found to be strong functions of illumination and voltage. These changes in depletion region can be attributed to the charges at interface and its reorder and restructure under illumination and electric field, but changes in accumulation region can be attributed to the series resistance (R_s) and interfacial layer. The values of ϵ'' and $\tan\delta$ show a step increase with the increasing voltage for each illumination level while the values of ϵ' show an anomalous peak ($\sim 1V$). C-V plot shows an intersection behavior at about 2.2V due to lack of enough free charges in low illumination. The value of σ_{ac} increases with increasing illumination and voltage due to the formation electron-hole pairs. The M'' vs V have two peaks for each illumination level and peak value increases with increasing illumination level and its positions tend to shift towards low voltage region.

GaN as an Efficient Photoanode for the Hydrogen Generation via Solar Water Splitting

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We present a detailed study on the utilization of various GaN structures for the hydrogen generation from water using solar energy. The employment of GaN as a photoanode in the photo-electrochemical cell (PEC) showed a superior behaviors in terms of its stability as well as hydrogen production efficiency. Initially, the doping profile of bare n-type GaN was optimized on the bases of performance and surface corrosion resistance. After the optimization of its doping profile, n-type GaN was sandwiched between two layers of undoped GaN to form hybrid photoanode structures. Controlling the thickness of the undoped GaN cap layer as well as employing n-type GaN with proper carrier concentration led to enhanced photocurrent density at zero bias and stable water splitting performance along with no surface corrosion. The efficiency of hydrogen generation was further improved by the band-edge engineering made through the deposition of NiO cocatalyst on the top of these hybrid structures. Stable surfaces against chemical corrosion and improved photocatalytic activity were achieved after optimizing the fabrication parameters of NiO. The remarkable enhancement of GaN/NiO photoanode performance was attributed to the efficient charge separation that led to rapid carrier transportation between the PEC electrodes.

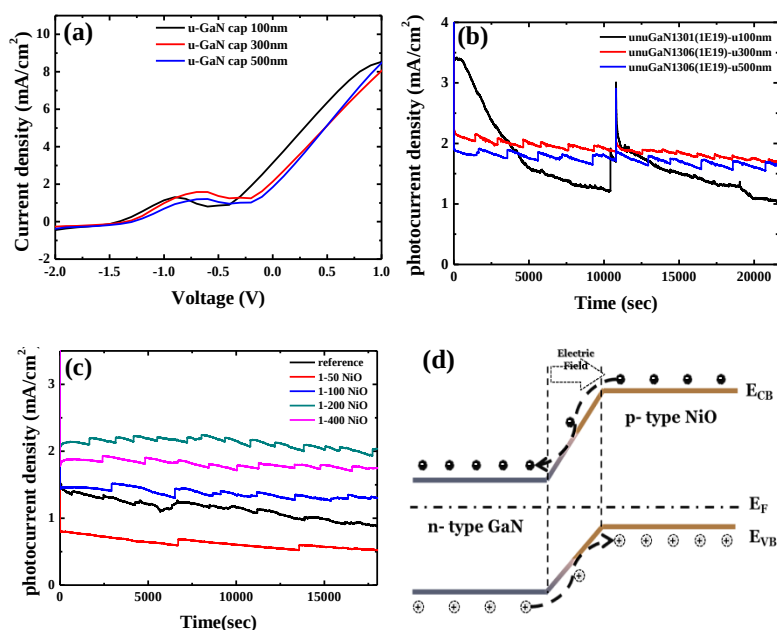


Figure: (a) Current density as a function of undoped-GaN capping layer thickness, (b) Stability of hybrid u-GaN/n-GaN/u-GaN structures with different u-GaN cap thickness, (c) Stability of GaN/NiO photoanode and (d) Schematic diagram illustrates the band edge bending after the deposition of NiO

The influence of SnO₂ film thickness on electronic and dielectric behavior of Au/SnO₂/p-Si structures

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A set of Au/ SnO₂/p-Si MOS capacitors with various thicknesses of SnO₂ interlayer has been prepared. The temperature and frequency dependence of electrical and dielectric behavior of the Au/SnO₂/p-Si structures have been investigated. The non-linear behavior of $\ln(I)$ vs. $\ln(V)$ and $\ln(I/V)$ vs. $V^{1/2}$ plots indicated that the thermoionic emission theory can be applied to evaluate junction parameters for the investigated MOS capacitors. Investigation of the effects of interlayer thicknesses on the various junction parameters indicated that the junction parameters such as barrier height, ideality factor, dielectric constant, dielectric loss and real and imaginary part of electrical modulus depend on the interlayer thickness. The increasing thickness of SnO₂ layer leads to decreasing the reverse bias current and capacitance of the device. A close analysis of the frequency dependent dielectric behavior of the devices showed that real part of the dielectric function ($\epsilon^*(\omega)$) exhibits non-Debye type relaxation for all temperatures, the real part of the $\epsilon^*(\omega)$ displayed a step decrease at the frequency where the dielectric loss shows a relaxation peak. Interface properties of the fabricated structure were investigated by capacitance-voltage and conductance-voltage measurements. The observed peak in conductance/angular frequency versus logarithm of frequency plot and the shift of the peak position to higher frequency have been attributed to the presence of uniformly distributed interface trap states in the silicon band gap. Frequency and temperature dependence of the alternating current conductivity have been analyzed in terms of quantum mechanical tunneling and correlated barrier hopping models. We have found no results supporting the quantum mechanical tunneling model.

Temperature and Voltage Dependence Dielectric Properties and ac electrical conductivity in Au/PVC+TCNQ/p-Si structures

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The dielectric properties and ac conductivity (σ_{ac}) of Au/PVC+TCNQ/p-Si structures have been investigated in the wide temperature range of 120-400 K using capacitance-voltage (C-V) and conductance-voltage (G/ω -V) measurements at 1 MHz. It has been found that the forward bias C-V plots exhibit an anomalous peak. The effect of the series resistance (R_s), interfacial PVC+TCNQ layer and the density distribution of interfaces traps (D_{it}) on the anomalous peak and the dielectric characteristics were investigated in detail. All of the dielectric properties such as the real and imaginary parts of dielectric constant (ϵ' , ϵ''), electric modulus (M' and M''), and loss tangent ($\tan\delta$), and σ_{ac} values were found as strongly function of temperature and applied bias voltage. These changes become considerable high especially in depletion and accumulation regions. In addition, the voltage dependent R_s values were obtained and they decrease with increasing temperature. The C-V-T and G/ω -V-T measurements confirmed that the R_s , D_{it} , and PVC+TCNQ layer are very important parameters that strongly influence both dielectric properties and σ_{ac} of structures.

Characterization of $\text{TiO}_2/\text{Al}_2\text{O}_3$ Schottky Tunneling Barrier n-Channel Enhancement Mode InP MOSFET

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III-V semiconductors have significantly higher electron mobility and saturation velocity than silicon, it has high potential for high performance MOSFET. One major problem of III-V compound MOSFET is the native oxide which results in poor interface quality and leads to Fermi level pinning at the MOS interface. The $(\text{NH}_4)_2\text{S}$ solution can reduce the unstable native oxide and prevent III-V compound semiconductor from oxidizing [1]. It was used to improve the MOS quality in this study. Similar to silicon MOSFET, dimensions of III-V MOSFETs have been scaled for the benefits of performance and density. Schottky barrier MOSFET with ultra-shallow junction Schottky contact for source and drain can reduce short-channel effects [2]. However, the drain current is low. In order to improve the drain current, the reduction of Schottky barrier by dipoles induction arised from differences in the electronegativity (χ) or oxygen areal density (σ) of inserting dielectrics ($\text{Al}_2\text{O}_3/\text{TiO}_2$ in this study) between source/drain metal and semiconductor is an effective way [3, 4]. The combination of the large dipole magnitude and a low conduction band offset also result in low Schottky contact resistance. The Schottky contact resistance of Schottky diode (Al/S-InP) has 5 orders improvement with the insertion of dielectrics (Al/ $\text{TiO}_2/\text{Al}_2\text{O}_3$ /S-InP) from 2.1×10^9 to $1.3 \times 10^4 \Omega$. The drain current of n-channel enhancement mode Schottky barrier MOSFET has one order improvement with Al/ $\text{TiO}_2/\text{Al}_2\text{O}_3$ /S-InP source/drain contact structure, and can be improved from 2.29 to 28.9 $\mu\text{A}/\mu\text{m}$ at $V_G = 3 \text{ V}$ and $V_D = 2 \text{ V}$. In this study, the characteristics of high drain current of n-channel enhancement mode InP MOSFET with $\text{TiO}_2/\text{Al}_2\text{O}_3$ as gate oxides and source/drain Schottky tunneling barrier on $(\text{NH}_4)_2\text{S}_x$ -treated InP substrate were investigated.

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Electrical Characteristic Parameters of Pt(II)complex/p-Si Contacts Formed as Organic/Inorganic Semiconductor Structure

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We have tried to explore optical characteristics of Pt(II)complex compound and electrical characteristics of Pt(II)complex/p-Si contacts formed as organic/inorganic semiconductor structure. Pt(II)complex compound of bidentate ligand (N-APTH), which contains a ring of pyrimidine have been produced. Optical transmission measurements of the Pt(II)complex thin films were performed by using a UV-Visible spectrophotometer. From the optical measurements it was revealed that the Pt(II)complex compound may have a semiconductor characteristic with a band gap value of 2.58 eV (Fig. 1) [1]. A p type Si wafer with (100) orientation and 5-10 Ω -cm resistivity was used to fabricate Pt(II)Complex/p-Si contacts. The ohmic contact was formed by evaporating of Al on the back side of cleaned p-Si substrate, followed by annealing at 580 °C for 3 min in N₂ atmosphere. The thin Pt(II)complex layer was directly formed by adding Pt(II)complex solution in dimethylformamide (DMF) having a concentration of 0.2 mg/ml on the front surface of the p-Si substrate and left for the evaporation of the solvent at room temperature. After formation of Pt(II)complex/p-Si contact, Au top metal was evaporated by using a tungsten-heater through a shadow mask in vacuum coating at about 10⁻⁵ Torr. The contacts having an area of 7.85x10⁻³ cm² were labeled as D1, D2, D3, D4, D5, D6, D7, D8 and Dwtc (dot without top contact). The purpose of construction of the Dwtc diode is to verify that the rectifying property has occurred at the Pt(II)complex/p-Si interface. The determined mean values (3.57) of ideality factor for the contacts are greater than 1, indicating that the contacts show nonideal behaviors [2].

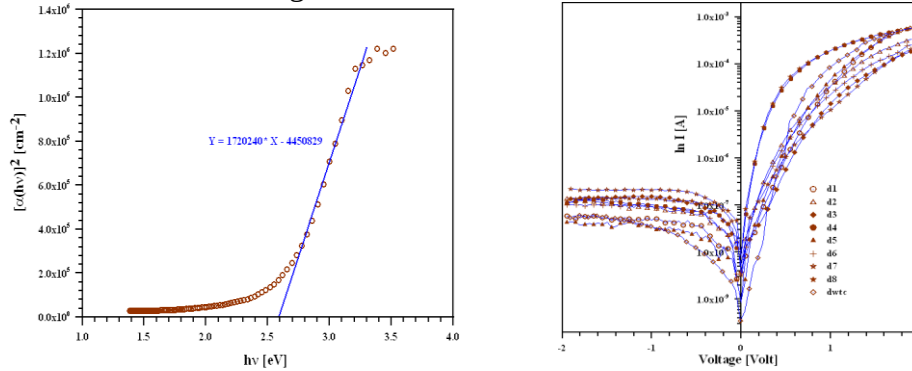


Fig. 1. The dependence of $(\alpha(h\nu))^2$ on photon energy for Pt(II)complex compound film

Fig. 2. Experimental forward and reverse bias current versus voltage characteristics of the Pt(II)complex/p-Si contacts for different dots.

The forward bias current-voltage (*I-V*) measurements revealed a satisfactory rectifying behavior of Pt(II) complex/p-Si contacts with a mean rectification ratio of 4.40×10^2 and a mean barrier height (BH) of 0.765 eV (Fig. 2). In addition, Cheung's functions and Norde's functions were used to obtain and verify the some electrical characteristic parameters of the contacts. The results obtained from both methods were compared and interpreted.

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Effects of Thermal Annealing on Ni/Au Based Schottky Contacts on n-GaN

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Recent developments in *GaN* based devices have revealed them to be strong candidates for future high power devices with high frequency operation. In the present work, we have investigated the effect of thermal annealing on the electrical and structural properties of *Ni/Au* Schottky contacts to *n-type GaN*. The Schottky contacts were fabricated by lift-off lithography using *Ni/Au* metallization on *GaN* grown by metal organic chemical vapor deposition (MOCVD) on a (0001) sapphire substrate. Electrical properties including current-voltage (*I-V*) and capacitance-voltage (*C-V*) characteristics were measured on the *Ni* based Schottky contacts as a function of annealing temperature. Annealing treatment was performed at a temperature ranging from 100 to 800 °C in increments of 100 °C for 2 min. The Schottky barrier heights (SBHs) for these contacts were obtained from *I-V* and *C-V* measurements. The values of SBH obtained from the *C-V* measurements were found to be higher than that of obtained from the *I-V* measurements. This case was attributed to the presence of the lateral inhomogeneities of the barrier height. It was seen that the SBH slightly increased from 0.560 ± 0.004 eV (as-deposited sample) to 0.563 ± 0.006 eV (annealed at 500 °C). The SBH of the *Ni/Au* Schottky contact for the other annealing temperatures of 600 °C was 0.617 ± 0.005 eV. The highest SBH was obtained for *Ni/Au* Schottky contact after annealing at 700 °C and the value was 0.910 ± 0.019 eV. The failure of rectifying behavior at high temperature annealing may be due to the interfacial reaction between *Ni/Au* and *GaN* layer. The variations in the chemical composition of the contacts with the annealing process were examined by XPS depth profile analysis. Increment in barrier height by as much as % 62.5 was successfully recorded by thermal annealing at 700°C and it was concluded that this technique was promising for high power *GaN* electronics.

Structural Optimization of $B_xGa_{1-x}As_{1-y}Bi_y$ Alloy Lattice Matched to GaAs

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III-V based alloys and heterostructures have much attention due to their great device applications as well as for the development of electronic, optic and optoelectronic devices. Because of this reason, the present study reports an investigation the structural optimization of $B_xGa_{1-x}As_{1-y}Bi_y$ alloy lattice matched to GaAs. Method of WIEN2k code [1] is applied considering Perdew-Burke-Ernzerhof (PBE) [2] correlation energy functional based on density functional theory (DFT) [3, 4]. We have constructed 2x2x1 supercell containing 32 atoms in zinc-blende (ZB) structure. We have used 6.25% increment for both boron and bismuth concentration. Our calculated lattice constants are shown in Table 1. By means of data in Table 1, we have plotted optimum boron and bismuth concentration for matching to GaAs lattice parameter as shown in Figure 1.

Table 1. The equilibrium lattice constants of different boron composition for fixed bismuth concentration.

$B_xGa_{1-x}As_{0.9375}Bi_{0.0625}$		$B_xGa_{1-x}As_{0.875}Bi_{0.125}$		$B_xGa_{1-x}As_{0.8125}Bi_{0.1875}$		$B_xGa_{1-x}As_{0.75}Bi_{0.25}$	
x-concentration (%)	a (Å)	x-concentration (%)	a (Å)	x-concentration (%)	a (Å)	x-concentration (%)	a (Å)
6.25	5.7600	12.50	5.7654	25.00	5.7296	25.00	5.7779
12.50	5.7117	18.75	5.7225	31.25	5.6831	31.25	5.7297
18.75	5.6690	25.00	5.6786	37.50	5.6287	37.50	5.6787
25.00	5.6231	31.25	5.6314	43.75	5.5729	43.75	5.6222

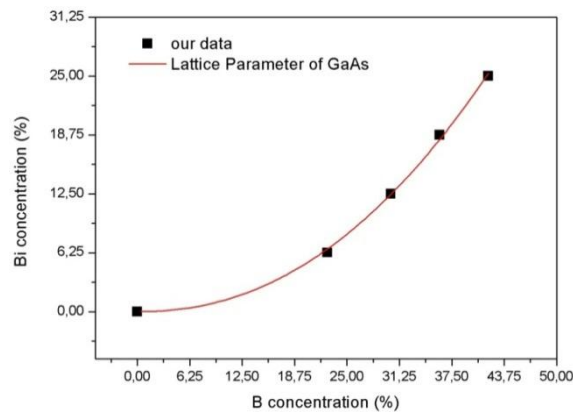


Figure 1. Optimum boron and bismuth concentration for matching to GaAs lattice parameter.

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Photovoltaic performance of dye-sensitized solar cells based on incorporated CNTs into Cr-doped TiO₂ nanoparticles

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A new photoanode electrode for fabrication of dye-sensitized solar cell (DSSC) in the form of mixtures of coated carbon nanotubes (CNTs) with TiO₂ and Cr-doped TiO₂ nanoparticles is reported. X-ray photoelectron spectroscopy (XPS) revealed that, Cr³⁺ and CNTs were successfully incorporated into the TiO₂ lattice. X-ray diffraction (XRD) analysis showed that Cr introduction hindered anatase to rutile phase transformation as well as grain growth during annealing process. Field emission scanning electron microscope (FE-SEM) images showed deposited films to have a porous morphology composed of nanoparticles and TiO₂ nanoparticles (TNTs) coated CNTs. UV-vis analysis showed that the absorbance of Cr-doped TiO₂ significantly was shifted to longer wavelength. The solar cell made of 3 at.% Cr and 0.025 wt% CNTs showed the maximum PCE of 7.47% amongst all fabricated DSSCs.

Photovoltaic response of dye-sensitized solar cell using 2,7-dichlorofluorescein as an organic dye

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The fabrication of dye- sensitized solar cell (DSSC) using 2,7-dichlorofluorescein as an organic dye. A FTO/ titanium dioxide (TiO₂) electrode was dipped in a solution of 2,7-dichlorofluorescein and covered with another FTO electrode to form dye-sensitized solar cell. Using dyes in the fabrication of solar cells increases the efficiency of the solar cell. The photovoltaic and impedance spectroscopy properties of the solar cell were investigated. A beam of light of different intensity was focused on the surface of the DSSC to measure the open circuit voltage, the short circuit current, the output power and the fill factor. The capacitance-voltage, the conductance-voltage, the series resistance-voltage characteristics of the solar cell were measured in a wide range of frequency for the first time for DSSC applications. Owing to the injection of electrons from the FTO electrode into TiO₂, the capacitance-voltage characteristic shows the behavior from the (+Ve) to (-Ve) capacitance. The photovoltaic of the DSSC can be improved using various organic semiconductors. Photons striking the dye with enough energy to be absorbed create an excited state of the dye, from which an electron can be "injected" directly into the conduction band of the TiO₂. From there it moves by diffusion to the clear anode on top.

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Random Multi Diode Model for Au/n-GaN Solar Cell Simulation

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Electronic properties of Au/n-GaN solar cell sensitively depend on lateral inhomogeneities. We present a new two dimensional (2D) simulation model for the mimic current-voltage behavior of laterally inhomogeneous Au/n-GaN solar cell. Zero barrier height inhomogeneity in device is generally assumed to conform Gaussian distribution in the literature. In this study, zero barrier height inhomogeneity has been adopted to obey random distribution. Looking at the structure of the device, the structure has columnar grains and gaps between the grains. Device are divided microcells owing to these grains in our developed model. Each microcell is considered as a elementary diode and all the microcells are connected in parallel to each other. In addition, surface areas of the diodes are discussed as circle. In this study, the current-voltage characteristics were obtained by our developed 2D device modeling program at room temperature in the dark and the light conditions. Also, random distribution of zero barrier height effect on two-dimensional interface state density was examined. Fill factor and efficiency values showed that a decreasing trend with increasing zero barrier height inhomogeneity of the device. Two-dimensional interface state density increases with increasing zero barrier height inhomogeneity.

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Operating Temperature Measurement of Photovoltaic Modules For Performance Calculations

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This study put forth measurement technique for temperature coefficient of photovoltaic modules under outside conditions. Output power of photovoltaic modules affected by several parameters. Cell temperature is an important parameter that affects the performance parameter of photovoltaic module or system. Packaging of the photovoltaic module and climate conditions parameters determine the temperature of photovoltaic module or system. Module is characterized by the manufacturers at Standard Test Conditions (STC: 1000 W/m², 25 °C, AM1.5) at laboratory. Nevertheless this conditions never founded at outside. So for realistic calculations we need dependence of external parameters under the outside conditions. Temperature variation affects the performance parameters (short circuit current: I_{SC} , open circuit voltage: V_{OC} , maximum power: P_M , efficiency: η , fill factor: FF) of modules dramatically. Ratio of changing in performance parameters over in a given temperature range defined as temperature coefficient of related performance parameter. Measurement of the performance parameter temperature coefficient of single crystalline photovoltaic module is performed.

The Influence of the Thickness of ZnO Buffer Layer on the Performance of the P3HT:PCBM Photovoltaic Cell

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Organic solar cells have attractive properties because of their flexibility, ease of processing, and low cost production. Yet, these cells have low power conversion efficiencies (PCEs) and device stabilities compared to their inorganic counterparts. Nevertheless, organic photovoltaic devices with inverted device architecture exhibit relatively more stable device operation in comparison to that of conventional structured devices. we fabricated inverted ITO/ZnO/P3HT:PCBM/V₂O₅/Ag organic photovoltaic cells with large active areas on 2"x2" glass substrates, in this study. The influence of the ZnO buffer layer thickness on the performance of the cell was investigated. ZnO buffer layers with different thicknesses were fabricated by adjusting the concentration of the precursor sol and spin coating parameters. The photovoltaic characteristics of devices were measured at ambient conditions under 100 mW/cm² AM1.5 simulated illumination. The photovoltaic performance of organic solar cells was found to be strongly dependent on ZnO surface quality and the thickness. The attained PCE of the cell was 2.7% with a dense and homogenous ZnO buffer layer derived from 0.1 M sol. The fill factor, short-circuit current density, and open-circuit voltage were measured as 0.56, 8.5 mA/cm², and 550 mV, respectively. The results indicate that the efficiency of inverted polymer solar cells can be significantly influenced by the thickness of the buffer layer. In addition to above mentioned studies, the photovoltaic cells were fabricated on flexible substrates with different sizes. The performance of silver nanowire transparent electrodes as top electrode were tested with an aim for all-solution processible device fabrication.

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Hybrid Solar Cells Using Inorganic Semiconductors and Conjugated Polymers

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Organic bulk heterojunction (BHJ) solar cells aroused interest due to several advantages such as low cost, light weight and compatibility with flexible substrates. However, life time issues and low power conversion efficiencies as compared to their inorganic counterparts seem to be the major drawbacks beyond commercialization. Hybrid solar cells, comprising of both organic and inorganic semiconductors can combine the unique properties of inorganic semiconductors with that of the organic semiconductors. Until recently, the most common way of fabricating hybrid solar cells was blending inorganic nanoparticles with polymers. Inorganic semiconductors can be manufactured as nanoparticles. Inorganic nanoparticles may have high absorption coefficients, their band gap can be changed depending on the size. Therefore, their absorption can be tuned. Their processing is possible using inorganic nanoparticles in solution/suspension. However, the power conversion efficiency of hybrid devices, in which nanoparticles are involved, needs improvement. One of the reasons for low efficiency is the surfactant around the nanoparticles. Another way to fabricate a hybrid solar cell is to make heterojunctions with bulk inorganic semiconductor and polymers. In this study, we investigated the effect of thin films of inorganic semiconductors such as titanium dioxide (TiO_2) and cadmium sulfide (CdS) or cadmium zinc sulfide (CdZnS) on the photovoltaic performance of hybrid solar cells. Thin films of inorganic semiconductors with different thicknesses were deposited using different deposition techniques. Current-voltage (I-V) characteristics were performed under dark and AM 1.5 illumination (mW/cm^2) conditions. We achieved a power conversion efficiency of ca 1.8 % for the solar cells employing TiO_2 .

Outdoor Stability Performance of CdTe Photovoltaic Modules

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Thin film photovoltaic Technologies are processing rapidly towards the goal of becoming a low cost power generation technology. A large number of companies on all over the world are working to increase the solar conversion efficiency of the solar cells, reducing the manufacturing costs and improving the reliability of the thin film devices. One of the activities of the Mugla Sıtkı Kocman University Clean Energy Research&Development Centre (MUTEK) is to investigate and identify the reliability and energy rating of commercially available different technology based photovoltaic modules. In this context, MUTEK has been conducting tests to study the outdoor performances of c-Si, a-Si and CdTe modules. This work describes the stability performance results from tests conducted at MUTEK over 5 years. Efficiency results are obtained from a specially designed Solar Measurement System with continuously taken Current-Voltage (I-V) curves. The results show that annual efficiency degradation in the tested CdTe module is over 7% in winter but it is about 6% in summer.

Comparison of bottom-up and top-down 3C-SiC NWFETs

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The demonstrated SiC-Nanowire Field Effect Transistors (NWFETs) have exhibited poor performance until-now. The nanowire/dielectric interface (with high values of fixed charges and interface traps) and the high unintentional doping leading to a carrier concentration value of the order of 10^{19} cm^{-3} have been presented as possible reasons for the poor SiC NWFETs performance [1]. All SiC NWFETs studies were performed on NWs grown by bottom up approaches.

In the present paper a comparison between NWFETs using bottom-up and top-down grown SiC NWs is presented.

Fig.1 shows the output characteristics of the two types of transistors. The improvement in device characteristics is obvious for the transistors with top-down grown NW as three orders of higher current is obtained. A similar difference is observed in the case of transconductance (0.05 nS at $V_{DS}=1.5 \text{ V}$ for the “bottom-up” transistors versus $5.3 \mu\text{S}$ at $V_{DS}=1 \text{ V}$ for the “top-down” ones). This is due to the lower doping density and increased thus carrier mobility value of the top-down grown nanowires.

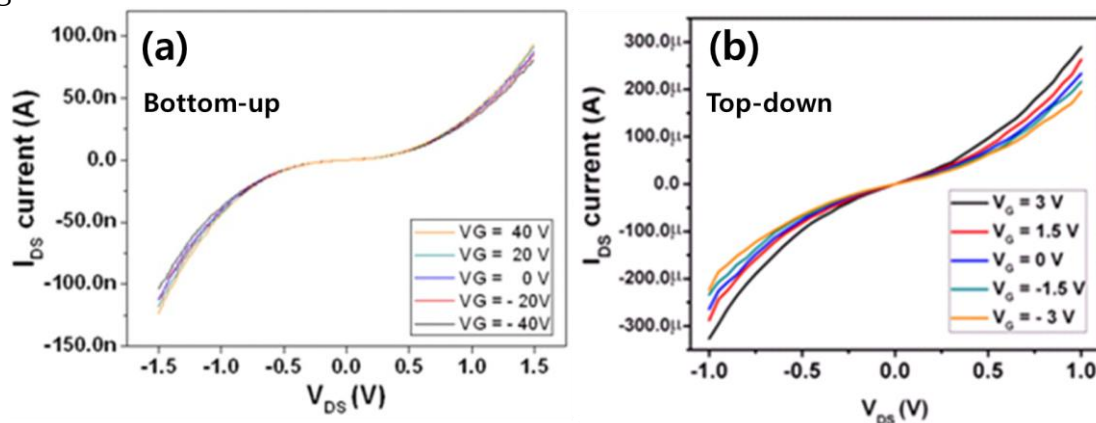


Figure 1. Output characteristics of cubic SiC NWFETs with: Bottom-up (a) and top-down (b) grown SiC NWs.

However, the same “top-down” transistors couldn’t be completely switched-off by varying the gate voltage. This behavior might be attributed to weak gate coupling originated from poor interface between SiC NW and SiO_2 gate dielectric. To further improve the device performance of NWFET, it is strongly needed to develop the top-gate SiC NWFET with the reliable high- k material deposition to enhance the gate coupling and reduce the interface states.

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The Electrical Characterization of Au/Aminopyridine/p-Si/Al Rectifying Contact With Organic Interface

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In this research, using the current-voltage measurements at the temperature range of 80K and 320K, the characteristic parameters of a contact, that was manufactured by using aminopyridine organic material coated on a *p*-Si semiconductor by electrochemical method, has been studied. The ideality factor (*n*) and the barrier height (Φ_b) value of the Au/aminopyridine/*p*-Si/Al Schottky diode laboratory temperature was calculated. Due to the organic used in, it was observed that the barrier height of the diode has been increased. Also it was seen that, by decreasing the temperature of the sample, the ideality factor was increased while the barrier height was decreased. The ideality factor of an ideal diode should be 1:01 or 1:02. However, the ideality factor of our devices was high. Having those ideality factors, high values and show various values while changing the temperature, can be attributed to the inhomogeneity of the metal-semiconductor contacts and the image force effect. Examined the I-V characteristics, series resistance effect was found at forward-bias, at high current and high voltage values. The ideality factor (*n*), the barrier height (Φ_b) and the series resistance (*R_s*) values were calculated using Cheung functions.

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SESSION B

Influence of Dodecyl Benzene Sulphonic Acid on Structural and Electrical Properties of P3HT:PCBM System

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In this study we intended to investigate how addition of dodecyl benzene sulphonic acid (DBSA) – a small-molecular additive – affects the spectroscopic, electronic and structural properties of a common binary systems used for organic photovoltaics (OPVs). Thereby we used poly(3-hexylthiophene):phenyl-C60-butyric acid methyl ester (P3HT:PCBM) blends as model system. P3HT and PCBM blends are one of the most investigated organic material systems for use in OPV cells. PCBM is one of the most efficient fullerene derivates so far. The fullerene thereby plays the role of electron acceptor while P3HT belongs to the polythiophene family, and acts as donor. In order to study the properties of such ternary blend films (P3HT:PCBM:DBSA), different techniques have been employed: UV-vis spectroscopy, Photoluminescence Spectroscopy (PL), Transient Absorption Spectroscopy (TAS), Optical Microscopy (OM), Differential Scanning Calorimetry (DSC) and Wide-angle X-ray scattering (WAX). At the end of this study, it is seen that from the conductivity measurements, DBSA doped the P3HT:PCBM films efficiently and conductivity of P3HT:PCBM increases nearly 1000 times. Additionally, UV-Vis spectroscopy on these P3HT:PCBM:DBSA ternary films reveals formation of a broad absorption feature around 800nm when DBSA is added to the P3HT:PCBM blends. DBSA changes the P3HT crystallinity as well as conductivity and UV-Vis spectra. P3HT grains seem to be better disturbed by the addition of DBSA but smaller grain sized crystals remained when more DBSA was introduced. As seen from the results, addition of DBSA opens new pathways for structural control of OPV blends. We find that such ternary blends have interesting properties both when incorporated in Organic Field Effect Transistor (OFET) and OPV applications.

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Light Modulation by PDLC Films

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Polymer dispersed liquid crystals (PDLCs) exhibit some specific properties which are suitable for making large area displays and variable transmittance windows. In their most common form, PDLC materials consist of micron-sized droplets of a low-molecular weight nematic liquid crystal dispersed in a polymer matrix [1-3]. These materials operate on the principle of electrically controlled light scattering. Because of the mismatch between effective refractive index of the liquid crystal and the refractive index of the polymer matrix, the incoming light is scattered by the droplets. However, if an electric field is applied across the PDLC film, the director of the liquid crystal will align with the field. If the ordinary refractive index of the liquid crystal matches the refractive index of the solid polymer, then the light will propagate through the PDLC material without being scattered at the droplets. Removal of the electric field returns the PDLC system to the opaque state since the elastic torques due to the surface interactions at the droplet walls return the liquid crystal molecules to their initial state of alignment. Thus, the operating mechanism of PDLC films can be described in terms of the reorientation dynamics of the droplets by the applied electric field. The transmittance of the PDLC film depends on the average orientation of nematic directors which are determined by the balance between electric and elastic torques. The elastic torques are due to splay, twist and bend deformations and depend on the director configuration. The optical transmission of the PDLC is influenced by several parameters such as the shape and size of LC droplets, LC concentration and PDLC film thickness [4]. In this study, thin PDLC films with nematic and chiral smectic materials were prepared by photopolymerization induced phase separation of the polymer-liquid crystal mixture on illumination with ultraviolet light. Optical properties of these films were investigated. The alignment of the samples and the switching mechanism were also discussed.

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Modeling of Dye-Sensitized Solar Cells for Characterized Devices Manufactured Using New Synthesized Organic Dyes

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Characterization results of two different new organic photo-sensitizers based on D (triphenylamine)- π -A (acceptor) are presented. The synthesis is evaluated to reach efficient dye-sensitized solar cells (DSSCs) through investigating photo-current vs. voltage (I-V) characteristics. The measurements are performed under standard AM 1.5 illumination. The DSSCs are analytically simulated using the experimental data. As a result of the simulation, we obtain the main parameters of DSSCs; such as short circuit current, open circuit voltage, fill factor, efficiency, series and shunt resistances, diode ideality factor and diode saturation current. The simulation is based on the equivalent circuit modeling with respect to different illumination intensities. Finally we compare the modeling results with that of experimental ones and express variation of each parameter as a function of illumination intensity. According to our observation, the experimental data showed good agreement with theory for all ranges of illumination.

Oxygen gas detection by electrochemically deposited ZnO

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Five undoped ZnO thin films were electrochemically deposited at different cathodic potentials on InSe substrates. Structural characterization on the grown films showed that the films have varying grain sizes from 5 to 16 nm and surface roughnesses from 26 nm to 207 nm. As an ohmic contact material, Ag metal was evaporated on the films in order to carry out the gas sensing measurements by resistance at various temperatures ranging from 50 °C to 275 °C. The gas sensing responses of the Ag/ZnO devices have been found to be linearly increased with operating temperature of the device showing that O₂ adsorption of the surface is higher at high temperatures. The response time of the Ag/ZnO gas sensing devices was measured and it is evidently seen that samples show different recovery and response times. As short as the 15 s recovery time and the 40 s response time have been observed which shows that the undoped electrochemically deposited ZnO can reliably be a good candidate for O₂ gas sensing element. Also, one to one correlation of the gas responses with the grain size of the produced ZnO thin films have been realized.

Dynamic Response of The Graphene Gas Sensors Towards CO, H₂ And NH₃ Gases At Different Temperatures

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Graphene has been considered as an excellent candidate for future electronics because of its extraordinary mechanical [1, 2-4] electrical [1, 5-8] and thermal [9] properties. Gas sensing is one of the most promising applications for graphene because of its huge surface area and its extremely high carrier mobility [10, 11]. In this study, we studied dynamic response of the graphene field effect transistor (GFET) gas sensors towards carbon monoxide (CO), hydrogen (H₂) and ammonia (NH₃) gases at different temperatures. The electrical characterizations of the fabricated backgate graphene transistors were made under 3.0×10^{-5} mbar vacuum environment using Keithley 2612A source meter (200V, 10A Pulse). We demonstrate that graphene field effect gas sensors can detect gas molecules at extremely low concentrations at room temperature and two different temperatures, namely 90 °C and 120 °C. The detection limits depending on temperature have been measured.

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Preparation and characterization of p-type nc-a-Si:H thin film by RF magnetron sputtering

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Nanocrystalline amorphous silicon hydrogenated on glass substrates have been prepared by RF magnetron sputtering from High purity (>99.99%) highly doped Si target at different substrate temperatures. The structural properties and morphology of thin film were characterized by XRD, UV–Visible-NIR spectrophotometer, transmission electron microscopy, Fourier transform infrared spectroscopy, and Raman spectroscopy. XRD data of Si thin film prepared at different substrate temperatures shows that our films is nanocrystalline materials and the crystallinity increase with increasing the deposition temperature. The electrical conductivity data showed that the conductivity of our films is in line with XRD data where it increases with increasing the deposition temperature. Hall Effect measurements show that our film is p-type with suitable carrier concentration and mobility.

PEG Assisted Hydrothermal Synthesis and Characterization of

Co-doped ZnO DMS Nanoparticles

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A systematic investigation was done to determine the structural, morphological and magnetic properties of undoped and Co doped ZnO ($\text{Co}_{0.1}\text{Zn}_{0.9}\text{O}$) nanoparticles synthesized by a simple PEG assisted hydrothermal technique. XRD, FE-SEM and EDX measurements were implemented for the structural, morphological and compositional investigation of the products. Additionally VSM and ESR were used for the magnetic property investigations of Co doped ZnO sample. Average particle sizes of the nanoparticles were estimated using Debye-Scherrer's equation and found as 23.7 nm and 16.5 nm, respectively. SEM images of the nanoparticles confirm that the size of the nanoparticles vary between 20 nm to 100 nm which is attributed to PEG surfactant on the surface of the nanoparticles. Magnetization measurements have shown that the particles have room temperature ferromagnetic behavior with relatively high coercive fields. Magnetization and the coercive field of the sample increase by decreasing the temperature as expected. The broad ESR signal having a resonance field of 2750 G (g-value of 2.54) and a line width of 2089 G is attributed to ferromagnetism (FMR) which arises due to the long range exchange interactions and transition within the ground state of ferromagnetic domain.

Note: This abstract was not presented at the ISSTC-2014 because the presenter was unable to attend.

Sonochemically Grown ZnO Nanorods for CO Sensing

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A simple fabrication, sonochemical growth technique for ZnO-nanorod-based device and their implementation as a CO sensor is reported. The presented ZnO nanorod sensor platform contains a Au interdigitated electrode structure, which is realized by conventional photolithography on a microscope glass. The nanorods are grown at room ambient. In order to detect the physical signals, changes in electrical resistance was measured. Recently, ZnO Nanostructures have been subject to great deal of research due to their electronic, biocompatible, and optical properties for different sensor applications. ZnO, a II–VI semiconductor, has a wide direct band gap ($E_g = 3.37$ eV) and a large exciton binding energy (60 meV). It also has high mechanical and thermal stability because of high melting point (1975 °C). One-dimensional (1-D) ZnO nanostructures have been synthesized by different techniques. In order to successfully integrate ZnO nanostructures into microelectronic circuits, the growth conditions (pressure, temperature etc.) must be close to the room temperature. Sonochemistry is a straight forward and fast approach to grow nanoparticles and 1-D nanostructures on different substrates. When ultrasound is applied on a liquid, cavitation which is the formation of microbubbles form due to the large negative pressure. When the microbubbles collapse, great amount of local energy (5000 K temperature and up to 1800 atm. pressure) is released during ultrasonic cavitation. High cooling rate (1010 K/s) due to the surrounding liquid makes the nanostructure growth possible at room temperature without any additional heating. The properties and performance of the device were examined by Scanning Electron Microscope (SEM), Energy-dispersive X-ray spectroscopy (EDS), Raman Spectroscopy and CO Gas Absorption Measurement System. CO gas absorption measurement was done in closed environment. The resistivity and sensitivity measurements of sonochemically grown ZnO nanorod thin film gas sensor for CO sensing suggest that sonochemical growth technique can be a very good alternative for growth and sensor application of 1-D ZnO nanostructures

Synthesis and thermoluminescence of undoped and Mn-doped ZnS nanocrystalline films grown by spray pyrolysis method

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Undoped and manganese(Mn) doped Zinc sulfide (ZnS) nanocrystalline films have been prepared on glass substrate by spray pyrolysis technique. The films were doped with manganese using the direct method consisting in the addition of a manganese salt (MnCl₂) in the spray solution. Variation of structural, electrical, optical and thermoluminescence (TL) properties with doping material is investigated in detail.

The effects of Series resistance and interface trap on Current-Voltage (I-V) Characteristics in Au/n-Si (111) Schottky Barrier Diodes (SBDs) at Low Temperatures

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The forward bias I-V characteristics of Au-/n-Si(111) SBDs have been investigated in the temperature range of 80-290 K. The analysis of the temperature dependent of I-V data on the basis of the thermionic emission (TE) theory reveals that an abnormal increase of the Φ_{B0} and decrease of ideality factor (n) with increasing temperature. This changes in of Φ_{B0} and n was attributed the barrier inhomogeneities by assuming single Gaussian distribution (SGD) of BHs between metal and semiconductor. Therefore, the modified Richardson plot ($\ln(I_0/T^2) - q^2 \phi_o^2 / 2k^2 T^2$ vs q/kT) was drawn and mean barrier height (Φ_{B0}) and effective Richardson constant (A^*) values were found its slope and intercept. Thus, the obtained experimental value of the Richardson constant is close to the theoretical value of A^* for n-type Si. Hence, it has been concluded that the I-V-T characteristics of the Au-/n-Si(111) SBDs can be successfully explained on the basis of TE theory with a SGD of the BHs. In addition, the energy dependent density of interface trap (D_{it}) profile were obtained by using voltage dependent ideality factor (n_V), effective barrier height (ϕ_e) and series resistance (R_s).

Effect of Barrier Height Variations on SE Dopant Contrast

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The physical mechanism responsible for the SE dopant contrast is not fully understood. However, several hypotheses (models) have been suggested. Formation of m-s contact of barrier height based on the difference between the metal work function and electron affinity of the semiconductor is one of the mechanisms which is suggested to be responsible for this contrast. In this paper, the validity of the m-s contact model on SE contrast is further investigated in Si to clarify the effect of barrier height variations of Al/Si diodes by heat treatment on the SE dopant contrast. The barrier height variations have been estimated using KPM.

Optical study of GaAsBi layers grown on GaAs substrates by metalorganic vapor phase epitaxy

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Photoreflectance (PR) and photoluminescence (PL) spectra of GaAs_{1-x}Bi_x alloys grown by metalorganic vapor phase epitaxy, for x up to 4.8 %, were measured at temperatures ranging from 12 to 300 K. The PR signal shift due to the temperature change decreases with increasing Bi content of GaAsBi alloys. A dominant peak in PL spectra of GaAsBi was observed when temperature is below 100 K. This peak is attributed to carrier localization at low temperatures resulting from Bi-related localized states in GaAsBi. The localized state emission partly contributes to the decrease in the band gap energy shift. In addition, the small PR signal shift at high temperatures is due to the reduction in the temperature dependence of the band gap energy. From the analysis of the band gap energy evolution with temperature using the Bose-Einstein statistical expression, the average phonon energy is much larger than that expected from the linear interpolation between GaAs and GaBi, indicating that the interaction between electrons and phonons localized at Bi atoms plays an important role in the reduction of the temperature dependence of the band gap energy of GaAsBi alloys. A decrease in PR signal has been also found when the temperature was lowered. This effect is attributed to a weakening of modulation efficiency, which is induced by carrier localization that has been evidenced in low temperature PL.

Termally evaporated CZTS thin films for p-CZTS/n-Si heterojunction

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Cu₂ZnSnS₄ (CZTS) is a quaternary semiconducting compound. It has a direct band gap of 1.5 eV and high absorption coefficient (10⁴ cm⁻¹) and can be used as a promising alternative material. Because it has not contained rare and expensive elements, CZTS has the potential for low-cost commercial systems. In this study, Cu₂ZnSnS₄ thin films were formed on an n-Si semiconductor and a glass substrates by thermal co-evaporation of Cu, Zn and Sn metals and annealing at 500 °C in S+N₂ atmosphere. The structural properties of thin films were analyzed by the help of scanning electron microscop (SEM), electron dispersive x-ray spectroscopy (EDS) and x-ray diffraction (XRD). Optical band gap of CZTS thin films were determined by UV-vis data. Electrical parameters of the thin films including mobility, resistivity and carrier concentration were extracted by means of Hall Effect measurements. Electrical and photovoltaic parameters of a p-CZTS/n-Si heterojunction were analyzed using its current-voltage (*I-V*) measurements in dark and a solar simulator with AM1.5 global filter at room temperature.

Dielectric Characteristics of Gamma Irradiated MOS Capacitor

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The dielectric characteristics of gamma irradiated metal-oxide-semiconductor (MOS) capacitor were studied. The MOS capacitor was irradiated by a ⁶⁰Co gamma radiation source with a dose rate of 0.69 kGy/h. The dielectric characteristics such as dielectric constant (ϵ'), dielectric loss (ϵ''), loss factor ($\tan\delta$) and ac electrical conductivity (σ_{ac}) were calculated from the capacitance-voltage (C-V) and conductance-voltage (G/ ω -V) measurements. A decrease in the C and G/ ω values was observed after irradiation. This change was attributed to decrease in the net ionized dopant concentration with gamma irradiation. The results showed that the ϵ' , ϵ'' and σ_{ac} were found to decrease with an increased radiation dose

The influence of Substrate Temperature on the Structural and Electrical Characteristics of Au/p-CdTe/Al Schottky Barrier Diodes

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We investigated the structural and electrical properties of Au/p-CdTe/Al Schottky barrier diodes fabricated from evaporated CdTe films at substrate temperatures of 200 and 300 K in a quasi-closed volume on glass and Au coated glass substrates. Post-deposition thermal annealing at 400 °C for 30 min in air atmosphere was applied to change the conduction type of the CdTe films from n to p-type. X-ray diffraction studies showed that CdTe films were polycrystalline in nature with zinc-blende structure and a strong (1 1 1) texture. Crystallite size of the films increased from 37 nm to 43 nm with the increasing deposition temperature from 200 to 300 K. The current-voltage (I-V) characteristics of Au/p-CdTe/Al structures showed that the Schottky diodes clearly display rectifying behavior. The ideality factors of the diodes produced were found to be 5.56 and 8.77 for the deposition temperatures of 200 and 300 K, respectively. The barrier heights of diode grown at 200 and 300 K were found to be 0.82 eV and 0.77 eV corresponding to grain size of 37 nm and 43 nm, respectively. From capacitance-voltage (C-V) characteristics, the barrier heights of diode were determined to be 0.85 eV and 0.75 eV for the diodes deposited at 200 and 300 K, respectively.

Tuning the Optical Polarization of ZnO Nanorods by an applied Hydrostatic Pressure

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In the present work we study the electronic and optical properties of ZnO nanorods [1] under hydrostatic pressure for different aspect ratio using atomistic empirical pseudopotentials [2,3,4,5] with the relaxed atomic positions [6] and configuration interaction for the excitonic states [7]. For hydrostatic pressures greater than 2 GPa we find a sharp crossover for the optical polarization, from an in-plane polarized luminescence to an out-of-plane (along *c*-axis) polarization for NRs with aspect ratio smaller than 3. This suggests the possibility to tailor the optical polarization not only by a change in morphology but also by a change in hydrostatic pressure. We elucidate the underlying mechanism from an analysis of the valence band structure and highlight the importance of exciton correlations.

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Ionic Liquid-Based Synthesis of Polyaniline-MnFe₂O₄-CTAB

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Polyaniline-MnFe₂O₄ nanocomposite was successfully synthesized by using 1-butyl-3-methyl-imidazolium bromide (BMIMBr) as ionic liquid and cetyl trimethylammonium bromide (CTAB) as surfactant via in-situ polymerization. Structural, morphological, spectral and magnetic investigation of the product were done by X-Ray powder Diffractometry (XRD), Fourier Transform Infrared spectroscopy (FT-IR), Thermal Gravimetric Analyzer (TGA), Transmission Electron Microscopy (TEM), Vibrating Sample Magnetometry (VSM) respectively. Electrical Properties of PANI-MnFe₂O₄-CTAB nanocomposite was characterized with a measurement of an impedance spectroscopy, which was evaluated at frequency range varying from 1Hz to 3MHz for temperature range of 20 - 120°C. In general ac conductivity remained almost unchanged until it reaches up to 160 kHz, and then reduced slightly almost for all temperatures except for some slight fluctuation somehow.

SESSION C

Antireflective ZnSnO/Ag bilayer source and drain electrodes for transparent ZnSnO channel-based thin film transistors

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Transparent oxide semiconductors (TOSs) have attracted great interest as next generation channel materials for transparent thin film transistors (TTFTs) and high performance and large area flat panel displays because of advantages, such as a high field effect mobility, excellent switching properties, a sputtering-based large area, low temperature deposition processing, and good process uniformity. Among the key components in TTFTs, transparent source and drain (S/D) electrodes are very important because the electrical properties and transparency of TTFTs are critically affected by the electrical and optical properties of the S/D electrodes. For these reasons, highly transparent conducting oxide materials, such as Sn-doped In₂O₃(ITO) and Zn-doped In₂O₃(IZO) films, have extensively been used as transparent S/D electrodes for TTFTs in academic and industrial research. Despite the high transparency of the ITO and IZO films, they are not desirable transparent S/D materials for TTFTs since they have higher resistivity than metal S/D electrodes such as Mo, Ti, and Al. Therefore, it is imperative to develop transparent S/D electrodes with a low resistivity comparable to that of metallic S/D electrodes for use in high-performance TTFTs. For this purpose, we recently reported oxide-metal-oxide (OMO) multilayer S/D electrodes for InGaZnO-based TFTs.¹ The optimized IGZO-TFT with Al-ZnO (AZO)/Ag/AZO S/D electrodes showed fairly high device performance and transparency in the visible wavelength region due to very low resistance and effective antireflection originated from the OMO structure.² However, detailed investigation of ZnSnO(ZTO)/Ag bilayer and ZTO/Ag/ZTO trilayer S/D electrodes for ZTO channel-based all-transparent TFTs has not yet been reported. In this work, we report on antireflective ZnSnO (ZTO)/Ag bilayer and ZTO/Ag/ZTO trilayer source/drain (S/D) electrodes for highly-transparent ZTO channel-based thin film transistors (TFTs).³ Although both bilayer and trilayer films have a similar sheet resistance (3~5 Ohm/square), the ZTO/Ag bilayer is a more effective transparent S/D electrode for ZTO channel layer than the ZTO/Ag/ZTO trilayer S/D electrode, due to the direct contact of the Ag layer on the ZTO channel layer and a desirable oxide-metal-oxide multilayer structure for antireflection effects. ZTO channel-based all-transparent TFTs with ZTO/Ag bilayer S/D electrodes exhibited a saturation mobility of 4.54 cm²/Vs and a switching value (1.31 = V/decade), comparable to those of a ZTO channel-based TFT with metallic Ag S/D electrodes. This indicates that the antireflective ZTO/Ag bilayer is a promising transparent S/D electrode for use in all-transparent TFTs as a substitute for conventional opaque metal S/D electrodes.

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Density Functional Theory Study of SnO₂ and TiO₂

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The structural and mechanical properties of SnO₂ and TiO₂ at rutile (tetragonal) phases are investigated by performing first-principles density functional theory (DFT) calculations. Second order elastic stiffness constants, bulk modulus, first-derivative of bulk modulus, pressure behavior of these mechanical properties are studied. Structural properties and elastic constants of rutile phases SnO₂ and TiO₂ calculated in this study are compatible with experimental and other available theoretical studies. Electronic band gaps of these semiconductors are also calculated. However, the calculated values by using standard DFT are very small in comparison to experimental values.

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Influence of Sputtering Temperature on Surface Morphology of CdZnTe Thin Film

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The effects of sputtering temperature on surface morphology and optical characteristics of CdZnTe thin film were studied in this work. To do this, CdZnTe thin films were deposited on glass substrates by RF magnetron sputtering. During the deposition process, the various sputtering temperatures such as 200 °C, 300 °C and 400 °C were performed. The deposited thin films were annealed at 450 °C for an hour under flowing N₂ gas at atmospheric pressure. In order to investigate surface morphology XRD, SEM and AFM measurements were performed. In addition, optical characteristics were analysed by transmission spectra of fabricated films. The XRD analysis show in Fig. 1, the fabricated films have a cubic oriented (111), (220) and (311) polycrystalline structure and crystallization increases with increasing sputtering temperature. The structural treatment were also confirmed by SEM and AFM measurements. Moreover, band gap of the fabricated films were found to be 1.81, 1.82 and 2.20 eV for 200 °C, 300 °C and 400 °C sputter temperature, respectively. These results show that CdZnTe thin film sputtered at 400 °C indicates the desired behaviour.

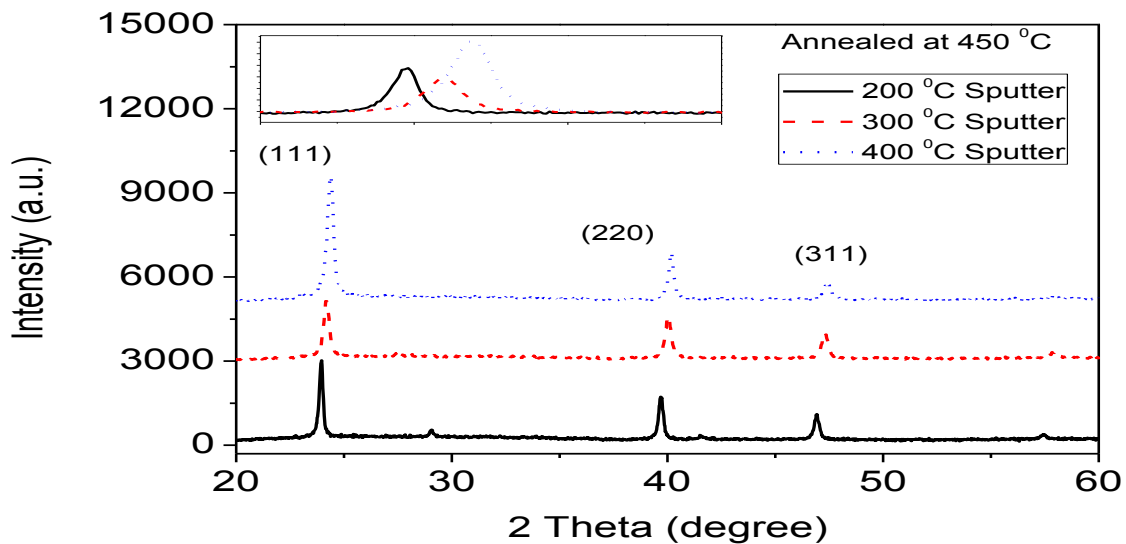


Figure 1: The XRD spectra of CdZnTe thin films deposited different temperatures.

Thin Film Transistors Based In Cadmium Sulfide Chalcogenide for Bendable Electronics

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Thin film transistors incorporating cadmium sulfide n-type semiconductor as the active layer were synthesized via chemical bath deposition (CBD) method using SiO₂ and HfO₂ as gate dielectric materials. Three different thicknesses (40, 90 and 140 nm) of gate dielectric were analyzed. CdS active layer was deposited by CBD at 70°C on either HfO₂ or SiO₂. Common gate transistors were fabricated with source and drain aluminum top contacts defined using a shadow mask process. No thermal annealing was performed throughout the device process. It is shown that using atomic layer deposition HfO₂ as the gate dielectric improves the effective mobility of the resulting TFT devices to values up to 25 cm²/Vs, compare to those using SiO₂ (~2.32 x 10⁻² cm²/Vs) as gate dielectric. This mobility is comparable to competing alternative materials that include amorphous silicon with a mobility value that range from 0.01 to 1 cm²/ Vs and organic semiconductors with a typical mobility of 6x10⁻² cm²/ Vs. Furthermore, threshold voltage decreases for the devices with HfO₂ as dielectric layer, which oscillated between 2-10V, while in the case of SiO₂, VT above ~10V were calculated. Effective mobility of 25 cm²/ Vs and threshold voltage of 2 V were obtained for devices with 90 nm HfO₂ gate dielectric, which give the best performance of CdS thin film transistors reported so far.

Phase transitions and dielectric properties of ferroelectric thin films with misfit dislocations and impurities

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It is quite contradictory that ferroelectric thin film oxides remain to be one of the highly sought after materials for tunable dielectrics, non-volatile memories, periodically poled phase shifters allowing effective quasi phase matching and antennas despite many reports on problems with these materials in prolonged usage. Other than the continuing scientific interest, another reason behind such devotion is likely due to the lack of replacement candidate materials for applications including the few mentioned above. The purpose of this presentation is to reveal the dependency of the dielectric response and phase transition temperatures on structural and ionized impurity defects. We undertake a computational approach in the continuum media limit to analyze the effect of relaxation of misfit strains via the inhomogeneous strain fields of interfacial misfit dislocations on depletion charge formation, dielectric response and phase transition temperatures in ferroelectric thin films. Fundamental equations of semiconductors, electromigration caused by internal fields and Landau-Ginzburg thermodynamic equation of state for ferroelectric polarization are numerically solved in the sandwich-type ferroelectric capacitor geometry. Understanding how the carriers due to impurities are distributed around inhomogeneities such as misfit dislocations is particularly important when considering leakage current mechanisms that are often a problem in ferroelectric thin films. We show that the different misfit strain relaxation states for films with various thicknesses have a direct impact on whether a ferroelectric film will be fully or partially depleted in the presence of ionized impurities. Implications of our results on functionality of ferroelectric films are discussed.

Comparison Spray Pyrolysis and Spin Coating Technique For Doubly Doped Tin Oxide

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Semiconductor materials have been extensively investigated because of their unique size dependent electronic, magnetic, optical, and electrochemical properties [1–3]. n-type semiconductor materials are used most applications [4,5]. Among these semiconductor materials, transparent conducting oxide (TCO) films with low electrical resistivity and high visible transmittance are widely used in solar cells, display devices, hybrid microelectronics and many other opto-electronic devices [6–8]. One of the most important TCOs for science and technology is tin oxide and doped tin oxide thin films which are doped various dopants such as fluorine, antimony and indium. There are many different techniques for obtain thin film TCOs e.g. sputtering, physical vapour deposition, chemical vapour deposition, spray pyrolysis [9], sol-gel spin coating [8]. In these techniques spray pyrolysis and spin coating are very easy and inexpensive for obtaining TCOs thin films.

This study is a comparison between spin coating and spray pyrolysis method for obtaining same solution for antimony and fluorine doped tin oxide thin film TCOs. Amount of dopants are fluorine 30 % wt. and antimony 2 % wt. in the tin oxide. X-ray diffraction (XRD) patterns indicates (200) tetragonal preferred orientation plane and (021) orthorhombic preferred orientation plane for spray pyrolysis and spin coating technique respectively. Although scanning electron microscope (SEM) images exhibit good smoothness for two techniques, spray pyrolysis technique images smoother than spin coating technique images. Ultraviolet-Visible (UV-Vis) spectrometer graphs shows that graphs of spin coating technique more transparent than graphs of spray pyrolysis technique. Photoluminescence (PL) spectroscopy graphs show that graphs of two methods have band transitions and defects at different wavelength. Fourier transform infrared (FTIR) spectrometer measurement depict that films of spray pyrolysis method have Sn-O-Sn, Sn-O and O-Sn-O bond vibrations and films of spin coating method have Sn-O-Sn and Sn-OH bond vibrations.

Consequently, obtained films of spray pyrolysis and spin coating techniques exhibit good properties for optoelectronic, gas sensors and solar cell applications in this study.

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Interfacing Semiconductors to Biological Structures: Challenges and Solutions

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Biological systems generate their own monitoring signals that need to be processed by semiconductor devices and presented to observers. However, the fidelity of the signals displayed for interpretations is essential to decode the messages correctly. The signal in a biological structure is in the form of electrochemical and mechanical changes while the signal in a semiconductor must be in the form of an electron flow. The interface between the biological system and the rest of the electronics is the sensor that converts any physical change into electron flow. The bottleneck in the process is the interface between biological structures and semiconductor signal processors that could hamper the reliability of the practice. Problems can be treated in four groups; the noise and interferences, signal distortion, effect of instrumentation on the biological system and effect of biological system on the instrumentation. The noise appears as random fluctuations added to the signals. It is mainly originated from passive components and semiconductors. The interferences come from the motion of sensors (motion artifacts) and connecting cables (triboelectric noise), power lines due to capacitive coupling and ground loops and radio frequencies. The effect of these can be minimized by careful selection and orientation of components. The instrument's inadequate frequency response and dynamic range cause signal distortion. All measurement systems draw some energy from the source. This is called instrument loading and it becomes a problem as the energy taken becomes comparable to the energy existing in the biological system. The semiconductor-based instrumentation requires electrical power to operate and this power is obtained from the power lines mostly. Any leakage of electrical current into the biological medium may cause electrocution that might be lethal. An electrical isolation becomes a must in many applications. Large electrical transients that occur on the biological side may damage sensitive electronic devices and this must be prevented by a proper input protection. All problems are solvable provided that their route causes are identified and the measurement system is carefully designed.

High Quality – Low Cost PENS (Percutaneous Electrical Nerve Stimulator) Designed for the Management of Chronic Pain: An Example of Usage of Semiconductors in Medicine

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Neurostimulation, a well-established clinical tool of modern medicine, is a process, by which nerves partially losing their function as a result of disease or trauma, are depolarized using artificial electrical pulses for regeneration. The method can be applied transcutaneously, percutaneously or by means implantation depending on the medical case. Anyhow, regardless of the application technic, therapeutic signals must be consistent with the nature of human neurophysiology [1]. Percutaneous Electrical Nerve Stimulators (PENS) have been reported to be effective for the management of chronic pain, e.g. fibromyalgia, migraine, both of which known to be intractable cases [2,3]. In this study, a low-cost, high-quality PENS device has been designed as a typical example of usage of semiconductor technology in medicine. A new MCU series, CC430 recently developed by Texas Instruments, was preferred because of the following technical advantages: 1) Ultra Low Power: ULP advisor of 15 guides enormously decrease current dissipation with little changes in the loops; 2) Easy-to-Use Radio Frequency (RF): A highly minimized embedded RF module provide 3 different operations at 433, 868 and 915 MHz frequencies. With a few passive components and antenna added to pcb, RF becomes available to be used; 3) Port Mapping: Allows input and output terminals of all digital hardware to be redirected to wanted pins. 4) Battery Voltage Sensor: Level of battery supplying the MCU can be followed; 5) DMA controller: enables stream data continue as main program in operation. On the other hand, our design is the first in PENS therapy in which the human body's own language is considered combining the modulation of stimulation synchronized heart rate, breathing frequency, and position of the patient (HBP mode of stimulation recently introduced).

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Bulk and Nanoscaled Organic Semiconductors Based Electronic, Optoelectronic and Electrochemical Devices

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Organic electronics is a fast growing multidisciplinary research and industrial area and is attracting the attention of physicists, chemists, biologists, industrialists, mechanical, electrical and material science engineers. It involves the design, synthesis and characterization of organic semiconductors, conducting polymers, organic nanomaterials, their derivatives and composites. These conjugated organic species have potential applications for a wide range of large area, disposable, flexible organic electric, electronic, photonic and electrochemical devices, such as, rechargeable batteries, supercapacitors, junction diodes, memories, solar cells, OLEDs, LDs, OFETs, displays, RFIDs, sensors, optical amplifiers, optical modulators, etc. These devices can be fabricated employing low cost fabrication technologies such as spin coating, dip coating, printing, etc. We have undertaken the synthesis of organic functional materials, their nanoparticles and their characterization for the fabrication of electric, electronic and photonic devices [1-8]. In this paper, results of our recent studies of bulk and nanoscaled organic semiconductors based organic electronic, optoelectronic and electrochemical devices will be reported.

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Band structure study of GaAs_{1-x}Bi_x/GaAs strained structures grown by MOVPE and investigated using photoreflectance measurements

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GaAsBi/GaAs strained structures will continue to attract significant attention and are also of interest for the new materials combinations which they allow. The calculation of their band structure (BS) suggests new device applications, including long wavelength lasers. In this context, we have calculated and discussed the electronic band structure of GaAs and GaAs_{1-x}Bi_x materials with and without taken into account strain effects. The band anti-crossing model (BAC) combined with the 8-band k.p method and the strain Hamiltonian are used to determine the strain-based BS at room temperature. The x-dependence of the energy levels and the interband transitions as well as the band-gap, the spin-orbit split-off and the valence-band splitting are investigated using two approaches: (i) application of strain effects to band structure of GaAsBi unstrained layers already calculated using BAC model. (ii) BS determination of GaAs host under uniaxial strain, then the use of BAC model to compute BS of GaAsBi strained layers. We find that the two procedures are not equivalent and only the first method matches well with the results derived from best fitting of photoreflectance spectra of GaAs_{1-x}Bi_x biaxial strained layers grown on GaAs by MOVPE (our work) and MBE (from the literature). Finally, the shear deformation potential changes are discussed as a function of GaBi mole fraction in GaAsBi.

Optical Characterization of CdS nanoparticles embedded into the comb-type amphiphilic graft copolymer

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This study refers to the synthesis and characterization of a novel organic/inorganic hybrid nanocomposite material containing cadmium sulfide (CdS) nanoparticles. For this purpose, a series of polypropylene (PP)-g-polyethylene glycol (PEG), PP-g-PEG comb-type amphiphilic graft copolymers were synthesized [1]. The CdS quantum dots into this polymer matrix were studied in view of the micelle formation by high resolution transmission electron microscopy (HRTEM) and its optical behavior by UV-vis spectroscopy and fluorescence emission spectroscopy techniques.

Figure 1 shows HRTEM images and FFT diffractograms of CdS quantum dots in different regions of PPEG2000-CdS sample. Fig. 1d illustrates FFT diffractogram for CdS quantum dots. In the FFT diffractogram, the inner circle spots and the arrows represented d-spacings of 3.37 and 2.06 Å, respectively. Similarly, these d-spacings were also measured on the HRTEM atomic lattice images (Fig. 1c). Therefore, HRTEM images and FFT micrographs exhibited lattice fringes with interplanar distances of 3.37 and 2.06 Å which are d-spacings for (111) plane and (220) planes of CdS cubic phase [2]. The PEG hydrophilic chains form stable bonds with the semiconductor nanoparticles preserving the characteristics of these materials. According to the HRTEM images, CdS quantum dots in the polymer micelles were below 10 nm size and this was supported by their optical characterization. The results show that PP-g-PEG amphiphilic copolymer is a fine colloidal stabilizer and host for nanosized particle formation [3]. Therefore, CdS embedded into PP-g-PEG amphiphilic comb-type graft copolymer can be regarded as the promising material for the industrial applications because of its strong film forming qualification [4,5].

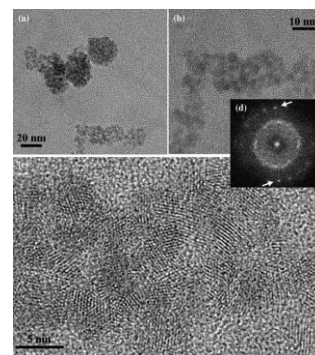


Fig. 1 a-c HRTEM images and d FFT diffractogram (of c) of CdS quantum dots in PPEG2000-CdS.

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Homogenous Barrier Height Work on Ni/EPI-n-Si structure

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In this research 50 dots of Ni/epi-n-Si structure is fabricated using epilayer n type Si wafer. Ohmic contact of the wafer is prepared using Al evaporation method then followed by annealing under inert gas of nitrogen. Schottky contacts of the devices are prepared by magnetron DC sputter technique. Then, current-voltage characteristics are measured by Keithley 2400 source-meter. Using thermionic emission theory, barrier height and ideality factor values are calculated. As a result, 50 dots of the devices have given a homogenous barrier height of 0.60 eV.

Time Resolved Terahertz Spectroscopy for Investigation of Charge Carrier Dynamics in Semiconductors

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Semiconductors are an important class of materials which can be applied to many areas. In order to use them in high speed electronic devices, it is important to understand their charge carrier dynamics on picosecond time scales after optical excitation and its dependence on the morphology. Time Resolved Terahertz Spectroscopy (TRTS) is a non-contact ultrafast optical pump - terahertz (THz) probe technique which allows a direct measurement of THz conductivity and transient carrier dynamics with sub-picosecond time evolution [1,2]. This study focuses on development of a TRTS system - which is a first in Turkey to our knowledge- in order to characterize a wide range of materials such as semiconductors, organic semiconductors and nanomaterials. TRTS system consists of three optical delay lines. In the first optical line, THz pulses are generated by optical rectification in a 1 mm thick <110> ZnTe crystal using 800 nm center wavelength laser pulses (700mW, 150 fs, 1 kHz). The terahertz beam was focused onto the sample using off-axis parabolic mirrors to a spot size of 4 mm at the sample position. The THz pulses are then detected electro-optically. A portion of the laser beam is split from the generation optical line and is overlapped with the THz beam at the detection crystal with the help of a TPX beam splitter. The detection pulse then co-propagates with the THz pulse through a 0.5 mm-thick <110> ZnTe crystal. Through the Pockells effect, phase of the detection pulses are retarded by the oscillating electric field of the THz radiation. The third delay line is the optical pump line. In this line there is an option to use an optical parametric amplifier (OPA), which can generate many different pump colors (1200-1700 nm and their harmonics) or use the fundamental wavelength from the laser. When a sample is excited with the ultrafast pump pulse, free charge carriers are generated and evolve in time. A response of the sample to excitation is mapped out by monitoring the THz signal while scanning the optical pump delay line. Initial measurements were performed on epitaxially grown GaAs on SI-Gallium Arsenide (GaAs) as well as undoped Silicon samples, which were excited by 400 nm and 800 nm center wavelength optical pump beams at moderate excitation levels. The results agree with previous measurements [3]. The details of the system and the capabilities of TRTS when applied to semiconductors will be discussed in detail.

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Zn substituted nanocrystalline cobalt ferrite: electrical properties

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Nanocrystalline cobalt ferrites substituted with Zn with formula, $\text{Co}_{1-x}\text{Zn}_x\text{Fe}_2\text{O}_4$ ($x = 0.0-1.0$) were prepared by hydrothermal method. In this process, triethylene glycol was used both as solvent and surfactant. The ac conductivity measurements of the samples showed a temperature-dependency at lower frequencies and independency at higher frequencies which indicates the ionic conductivity. The ac conductivity depends on the temperature. This conductivity can be fitted with the well-known power law model in higher frequency. The dc conductivity is assumed to obey the Arrhenius equation. The dielectric behavior in various temperatures ranges revealed frequency dependency in a reciprocal power law. The dissipation of energy stored within the nanoparticle was found to act upon the reciprocal power law of the frequency dependency. Both the analysis of electrical conductivity and the dielectric permittivity functions suggest that the ionic and polymer segmental mobility could strongly be coupled in the nanoparticles.

A Scoping Study into the Manufacture and Use of Nano-Materials in Malaysia

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Nanotechnology is a new and fast emerging field that involves the manufacture, processing, and application of materials that are in the size range of up to 100 nanometres (nm). Due to their extremely small size, nanomaterial (NMs) have a much greater surface area than their conventional forms, which in some cases results in novel or distinctly different properties. At such a small scale, quantum effects also appear to become much more important in determining the properties and characteristics of NMs. This has led to the development of novel materials with very desirable properties for a number of industrial and consumer applications. NMs can be defined as substances that are less than 100 nm in size in any one dimension, as they can be spherical, tubular, irregularly shaped, or can exist in fused, aggregated or agglomerated forms. Nanotechnology is a broad interdisciplinary area of research, development and industrial activity that has been growing rapidly world-wide for the past decade. It is a multidisciplinary grouping of physical, chemical, biological, engineering, and electronic, processes, materials, applications and concepts in which the defining characteristic is one of size. Much of the activity represented here could potentially be considered to be NMs. Nanotechnology is a rapidly growing sector of material manufacturing industry that has already achieved a multibillion US dollar market, which is widely expected to grow to 1 trillion US dollars by 2015. It is, therefore, not surprising that some NMs are already used in a variety of consumer products, such as titanium dioxide (TiO₂) in paints, and zinc oxide (ZnO) in sunscreen products. A number of applications are also in the pipeline; for example, for targeted drug delivery, gene therapy, cosmetics, stain-resistant coatings, industrial lubricants, advanced tyres and semiconductors.

Quantum noise quenching and squeezing in a two-photon laser

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A linear theory of two-photon laser by four-level atoms is presented. Coherence is induced by means of two dipole-allowed transitions driven by classical fields. The regime of parameters under which a laser signal can be phase locked and amplified is discussed through the corresponding Fokker-Planck equation. For larger values of driving fields Rabi frequencies, phase diffusion coefficient vanishes and becomes negative. The conditions obtained are analyzed numerically that lead to quantum noise quenching and squeezing.

Analysis of Leakage Current of Au/TiO₂/n-(4H-SiC) MIS structures using Frenkel-Poole and Schottky Emissions in Temperature Range of 200-380 K

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In order to determine the reverse bias leakage current mechanism in Au/TiO₂/n-4H-SiC (MIS) type Schottky barrier diodes (SBDs) were fabricated and their current-voltage-temperature (I-V-T) measurements were carried out in the temperature range of 200-380 K. The analysis of semi-logarithmic reverse bias I-V characteristics indicated that the main conduction/current process in leakage current flow by electrons emission from a trapped state at metal/semiconductor (M/S) interface into a continuum of interface traps (D_{it}) which associated with each conductive interface. The main electrical parameters such as ideality factor (n), barrier height (BH) (Φ_{Bo}), series and shunt resistances (R_s , R_{sh}) were also obtained as 5.09, 0.81 eV, 37.43 Ω and 435 k Ω at 200 K and 2.68, 0.95 eV, 5.99 Ω and 73 k Ω at 380 K, respectively. To explain the change in BH and n with temperature, Φ_{Bo} vs $q/2kT$ plot was drawn to obtain an evidence of a Gaussian distribution (GD) of the BHs and the mean value of BH ($\bar{\Phi}_{Bo}$) and standart deviation (σ_o) values were found from this plot as 1.396 eV and 0.176 V, respectively. The $\bar{\Phi}_{bo}$ and Richardson constant (A^*) values were found as 1.393 eV and 145.5 A.cm⁻²K⁻² using modified $\ln(I_o/T^2)-(q^2\sigma_s^2/2k^2T^2)$ vs q/kT plot, respectively. The energy density distribution profile of D_{it} was extracted from the forward-bias I-V data by taking into account the voltage dependent of the ideality factor (n_V), voltage dependent barrier height (Φ_e) and series resistance (R_s) of the structure at room temperature.

POSTER PRESENTATIONS

The Electrical Characteristics of Nanographene Oxide Based Organic Field Effect Transistors

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Graphene is one of the most exciting materials being investigated today, not only out of academic curiosity but also for its potential applications. Graphene, a new class of two-dimensional (2D) carbon crystal structure, holds a train of remarkable properties due to its fast electron transport, high chemical stability and strong mechanical strength [1]. We have studied the electrical characteristics of nanographene oxide (n-GO) organic field effect transistors with polymethyl methacrylate (PMMA) and poly-4-vinylphenol (PVP). In the first step to obtained synthesis n-GO. One of the alternate methods to prepare n-GO is achieved by oxidizing graphite via modified Hummers method. The n-GO as chemical structure consists of sheets of sp^2 hybridized carbon atoms arranged in hexagonal fashion with few sp^3 hybridized carbon atoms attached to hydroxyl or epoxide moieties. The edge areas of these sheets bear carboxyl or carbonyl groups. In flexible and large area electronic applications, the easy processability by solution based methods, dielectric properties, transparency and tunability of electronic properties widen the scope of graphene oxide [2,3]. The nanographene oxide (n-GO) was characterized by X-ray diffraction, FT-IR Spectroscopy and UV-visible spectroscopy. In the second step, n-GO based organic field effect transistors were prepared by spin coating and thermal evaporation technique on p-Si/SiO₂ substrate. The output and transfer characteristics of graphene oxide based organic transistors were investigated by Keithley- 4200 Semiconductor Characterization System (SCS).

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Electrical properties of I-V and C-V Characteristics of The Au/n-GaAs Schottky Diodes at High Temperatures

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In this paper, we have investigated the temperature-dependent current-voltage (I-V) and capacitance-voltage (C-V) characteristics of Au/n-GaAs Schottky barrier diodes (SBDs) in the temperature range of 280-415 K. The estimated barrier height for the Au/n-type GaAs SBDs from the I-V and C-V characteristics have varied from 0.901 eV to 0.963 eV (I-V) and 1.234 eV to 0.967 eV (C-V), and the ideality factor (n) from 1.45 to 1.69 in the temperature range 280 to 415 K. It has been observed that both the ideality factors and the barrier heights increased with increasing temperature. Such behavior is attributed to barrier inhomogeneities by assuming a Gaussian distribution (GD) of barrier heights at the interface. The conventional Richardson plots are found to be linear in the temperature range measured. Thus, both the $\ln(I_0/T^2)$ versus $(kT)^{-1}$ and $\ln(I_0/T^2)$ versus $(nkT)^{-1}$ plots gives a straight line corresponding to activation energies 0.773 eV and 0.870 eV, respectively. A Φ_{bo} vs $1/T$ plot was drawn to obtain evidence of a Gaussian distribution of the BHs, and values of $\bar{\Phi}_{bo} = 1.071$ eV and $\sigma_o = 0.094$ V for the mean BH and zero-bias standard deviation have been obtained from this plot, respectively.

Electrical Parameters of a DC Sputtered Mo/n-type 6H-SiC Schottky Barrier Diode

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A Mo/n-type 6H-SiC/Ni Schottky barrier diode (SBD) was fabricated by sputtering Mo metal on n-type 6H-SiC semiconductor. Before the formation of Mo/n-type 6H-SiC SBD, an ohmic contact was formed by thermal evaporation of Ni on Si face of n-type 6H-SiC and annealing at 950 °C for 10 minutes. It was seen that the structure had excellent rectification. The electrical parameters were extracted using its current-voltage (*I-V*) and capacitance-voltage (*C-V*) measurements carried out at room temperature. Very high (1.10 eV) barrier height and 1.635 ideality factor values were reported for Mo/n-type 6H-SiC using $\ln I-V$ plot. The barrier height and series resistance values of the diode were also calculated as 1.413 eV and 69 Ω from Norde functions, respectively. Furthermore, 1.938 eV barrier height value of Mo/n-type 6H-SiC SBD calculated from *C-V* measurements was larger than the one obtained *I-V* data.

Stability of the Gel-Based Electrolyte for the Organic Rectifiers

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In Figure 1 current-potential characteristics of Polyacrylamide (PAAm) hydrogel-based electrolyte, sandwiched between platinum-platinum electrodes and platinum-aluminum electrodes, are represented. As seen from this figure when the platinum-platinum electrodes are used no rectification is observed but for the platinum-aluminum electrodes a considerable rectification is clearly observable. The reason for rectification is the chemical reactions (anodic oxidation) between the aluminum and the free ions (H^+ and OH^-) trapped in the blobs of the heterogeneous polyacrylamide hydrogel. To be able to get a stable rectification and a long-life usage of this organic rectifier the stability of the gel-based electrolyte used in this system plays a crucial role [1]. In addition to the electrolyte stability the amount of the water in the gel-based electrolyte must also be controlled because the water decreases by the evaporation and the chemical reactions occur on the electrodes. In Figure 2 the swelling kinetics of the gel-based electrolyte depending on the number of the usage are given. Here almost no change in the swelling kinetics of the gel-based electrolyte was observed except just a little increase in the swelling degree. This small increase may be due to the some unreacted monomers in the gel and/or some small gel clusters which are not bonded to the infinite gel cluster. This figure clearly shows that after using the electrolyte for many times, the gel-based electrolyte can preserve its structure. The evaporation of the water can be prevented by either using this electrolyte in a sealed environment or the water can be added continuously to the system. Results show that this gel-based electrolyte is stable enough and a good candidate for the organic rectifiers.

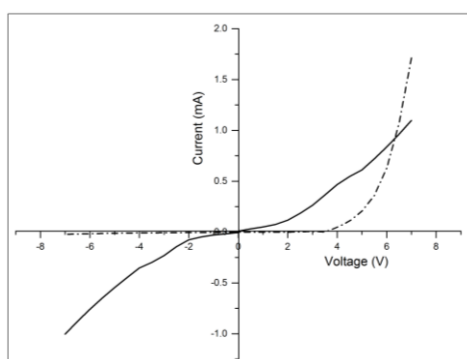


Figure 1: Current-potential characteristics of Polyacrylamide (PAAm) hydrogel-based electrolyte (Al/electrolyte/Pt : dash line, Pt/electrolyte/Pt : solid line)

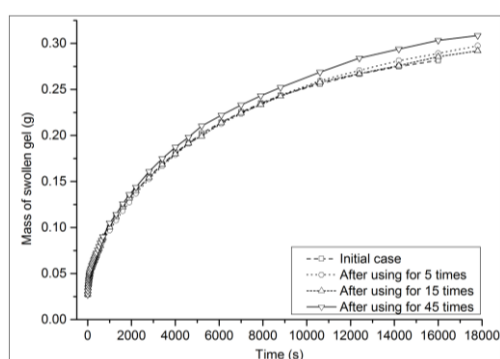


Figure 2: Mass of the swollen gel as function of the time with different number of the usage.

[1] E. Alveroglu, A. Gelir and Y.Yılmaz, Macromolecular Symposia, 281, 174 (2009).

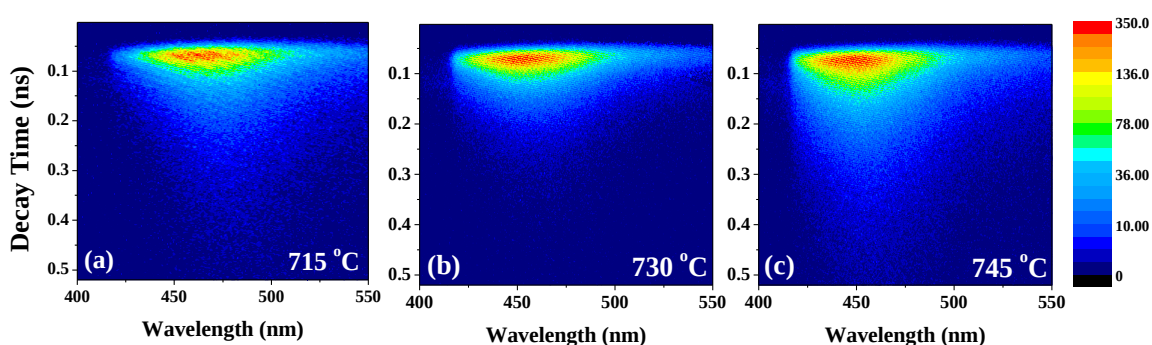
Luminescence and Carrier Dynamics of GaN/InGaN Multi-Quantum Well Coaxial Nanorods

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Luminescence and carrier dynamics of GaN/InGaN multi-quantum well coaxial nanorods (MCNRs) was studied by means of photoluminescence (PL), cathodoluminescence (CL) and time-resolved PL (TRPL). It was revealed that the growth temperature of InGaN greatly influenced the luminescence and carrier dynamics. Controllable emissions with efficient carrier confinement were realized after adjusting a very small temperature gap between successive GaN and InGaN growths. The PL of as-grown MCNR ensembles revealed an intense blue emission with intensity that increased with the reduction of temperature gap and a broad emission at longer wavelengths. CL measurements of several single nanorods, showed that this broad emission was due to the wetting layer formed unintentionally during the growth of GaN core nanorods and not contributed in the blue emission of MCNRs. Carrier dynamics was studied by TRPL, where ultrafast recombination rates were identified and attributed to the efficient radial confinement and the growth in non-polar direction. The temporal decay profiles of the probed samples showed a bi-exponential decay. The radiative and non-radiative lifetimes were calculated by fitting the PL decay data by using stretched exponential function and internal quantum efficiency. Fitting results showed that carrier kinetics within the InGaN quantum well were very sensitive to the growth temperature gap between quantum barrier and quantum well.



Three dimensional temporal maps showing the effect of InGaN growth temperature on the recombination lifetimes of MCNRs.

The Electrical and Photovoltaic Effect of Co/n-GaP Schottky Diode

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In this study, we were investigated current–voltage (I - V) measurements of Co/n type-GaP Schottky diodes and performed under dark and light conditions at room temperature. The forward bias I - V characteristics have been analyzed on the basis of standard thermionic emission (TE) theory and the characteristic parameters of the Schottky contacts (SCs) such as Schottky barrier height (SBH), ideality factor (n) have been determined from the I - V measurements. And we calculated some photovoltaic parameters. The device under light illumination shows a good photovoltaic behavior.

A Comparative electric and dielectric properties of Al/p-Si Structures with and without doping Co Interfacial PVA Layer

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In this study, Al/p-Si structures with and without Co-doped PVA interfacial layer which are called S₁ and S₂ were fabricated and their both electrical and dielectric properties were compared by using 300 kHz capacitance-voltage (C-V) and conductance-voltage (G/ω-V) measurements at room temperature. Experimental results show that both C and G or dielectric constant (ϵ'), dielectric loss (ϵ'') values were found as strongly function of applied bias voltage especially at inverse and accumulation bias regions. It was found that the value of R_s considerably decreases with doping Co material contrary to conductivity especially in the forward bias region. Such behavior can be attributed to the lack of free charges in pure PVA. The imaginary part of dielectric modulus (M'') gives two peaks for S₁ which are corresponding to enough reverse and forward biases and passes from a minimum at about zero bias. Also, it is clear that the minimum of the M'' for S₂ coincides with the maximum of the M'' for S₁ at zero bias. As a result, Co-doped PVA considerable improved the performance of structure. In addition, loss tangent ($\tan\delta$), ac conductivity (σ_{ac}) and real part of the electric modulus (M') were obtained and compared each other.

The influence of Al doping on the Structural Electrical and Optical Properties of ZnO Transparent Conducting Films

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ZnO and aluminum doped zinc oxide (ZnO:Al) films were deposited onto glass substrates using the low cost ultrasonic spray pyrolysis technique. The films were characterized and the effect of aluminium doping concentration on their optical, electrical, surface and structural properties was investigated as a function of aluminium doping between 0 and 5 at.%. The effects of aluminum dopant on the crystalline structure and orientation of the ZnO films were analyzed by X-ray diffraction (XRD) study. Surface morphology of the films was obtained by atomic force microscope (AFM). Optical properties were performed by UV-VIS spectrum measurements. The average optical transmittance of all films with the variation of doping concentration was 80% in the visible range of wavelength 600–700 nm. Optic method was used to obtain the optical band gap values of these films. In addition, the room temperature photoluminescence (PL) properties were investigated. The electrical resistivity of the films was measured by a four-point probe method.

Effect of Annealing Temperature on the Properties of ZnO films Prepared by Spray Pyrolysis

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Transparent and conductive zinc oxide (ZnO) thin films have been prepared by the ultrasonic spray pyrolysis (USP) technique. The prepared ZnO films were subjected to annealing treatment in air at temperatures ranging from 350 to 550°C for 2 h. The effects of annealing temperature on the surface, electrical and optical properties have been investigated. In order to evaluate the electrical and optical properties of films, a four-probe measurement and a UV-Vis spectroscopy have been carried out, respectively. All ZnO films deposited on glass are transparent, between 75% and 80% transmittance, within the visible wavelength region. The thicknesses of films have been measured by using spectroscopic ellipsometer (SE) technique. In addition, refractive index and extinction coefficient values have been determined with SE technique. The surface morphology of the annealed ZnO films has been characterized by atomic force microscopy (AFM). Based on our investigation, it can be concluded that annealing treatment plays an important role on the some physical properties of annealed ZnO films.

The current-transport mechanisms (CTMs) in Au/ppy/n-Si (MPS) type Schottky Barrier Diodes (SBDs) in the temperature range of 110-360 K

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The zero-bias barrier height ($\bar{\Phi}_{bo}$) and ideality factor (n) variation with temperature in Au/ppy/n-Si (MPS) type SBDs were investigated in the temperature range of 110-360 K using the forward bias current-voltage-temperature (I - V - T) measurements. While the value of $\bar{\Phi}_{bo}$, increases, n decreases with increasing temperature. Such changes in $\bar{\Phi}_{bo}$ and n with temperature was attributed to the presence of saddle point or pinch-off in the depletion region. The slope of conventional Richardson plot, $\ln(I_0/T^2)$ vs (q/kT) , has given Richardson constant (A^*) of 1.39510^{-8} A.(cmK)⁻² which is much lower than the known value of 112 A.(cmK)⁻² for n-Si. The mean values of $\bar{\Phi}_{bo}$ and standard deviation (σ_s) were obtained from the intercept and slope of $\bar{\Phi}_{bo}$ vs q/kT plot as 1.146 eV and 0.13 V. Thus, the values of $\bar{\Phi}_{bo}$ and effective value of A^* have obtained as 1.078 eV and 113.03 A.(cmK)⁻², respectively. This value of A^* is in a good agreement with the theoretical value of 112 A/cm²K² for n-Si. As a result, CTM in Au/ppy/n-Si (MPS) type SBD can be successfully explained on the basis of thermionic emission (TE) theory with Gaussian Distribution (GD) of BHs around $\bar{\Phi}_{bo}$.

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Optical Properties of $\text{BSb}_x\text{Bi}_{1-x}$ Alloy

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We have investigated optical properties which is very important for optoelectronic devices, such as laser modulators, photo detectors, optical amplifier and high efficient solar cells of $\text{BSb}_x\text{Bi}_{1-x}$ alloy. Calculations are performed by using density functional theory (DFT) based on the full potential linearized augmented plane wave method (FP-LAPW) [1,2]. For the exchange correlation potential, the generalized gradient approximation (GGA) of Perdew-Burke and Ernzerhof (PBE) has been used. In the first place, we have calculated equilibrium lattice constants (a_0) of $\text{BSb}_x\text{Bi}_{1-x}$ alloy by changing x concentration (0%, 6.25%, 12.5%, 18.75%, 25% and 31.25%). Our calculated results have showed that the $\text{BSb}_x\text{Bi}_{1-x}$ alloy has direct band gap character in the studied concentration interval. The calculated lattice constants and band gap energy of $\text{BSb}_x\text{Bi}_{1-x}$ alloy with different x concentration are presented in Table 1. Then, we have calculated the optical parameters (dielectric functions, absorption coefficient and refractive index, reflectivity, energy loss function and conductivity) of $\text{BSb}_x\text{Bi}_{1-x}$ alloy which is directly related to the energy band structure of the material.

Table 1. The equilibrium lattice constants and band gap energy of $\text{BSb}_x\text{Bi}_{1-x}$ alloy with different x concentration.

	x-concentration (%)	a (Å)	Eg (eV)
$\text{BSb}_x\text{Bi}_{1-x}$	0	5.5328	0.0955
	6.25	5.5150	0.2353
	12.50	5.4982	0.3665
	18.75	5.4826	0.4928
	25.00	5.4666	0.6087
	31.25	5.4501	0.7358

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Electrical and Photovoltaic Properties of Au/(Ni,Zn)-doped PVA/n-Si Structures in the Dark and Under 250 W Illumination Intensity

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Electrical and photovoltaic properties of Au/(Ni, Zn)-doped PVA/n-Si structures have been investigated in the dark and under 250 W illumination intensity through forward and reverse bias current-voltage (I-V), capacitance-voltage (C-V) and conductance-voltage (G/ω-V) measurements at room temperature. Also scanning electron microscopy (SEM) results indicate that PVA-Ni,Zn acetate film has a nanofiber structure. The reverse saturation current (I_0), ideality factor (n), and zero-bias-barrier height (Φ_{b0}) values were found as 8.41×10^{-7} A, 7.41 and 0.599 eV in dark and 1.56×10^{-6} A, 6.54 and 0.583 eV under 250 W illumination level. The forward bias semi-logarithmic I-V was described using two diode models in dark, indicating two current-transport mechanisms acting in the diode. The first mechanism can be attributed to recombination of carriers between Au/(Ni, Zn)-doped PVA and second one can be attributed to recombination in the depletion region. Both the C and G values increase with increasing illumination level due to the illumination-induced charges at interface trap (D_{it}) and the formation of electron-hole pairs. In addition, the energy density distribution profile of D_{it} was extracted from the forward-bias I-V data by taking into account the voltage dependent of the effective barrier height (ϕ_e) and series resistance (R_s) of the structure.

A Study on the Dielectric Relaxations In Solid State Electrolyte Systems: Nyquist & Bode Plots of Complex Capacitance

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The key objective of this work is to evaluate the Cole-Cole (Nyquist) and Bode plots of the complex capacitance data of several heterogeneous electrolyte systems whose characteristic shapes in particular may be of relevance to the dynamics of the bound or mobile charges in the bulk or at the interfacial regions of a pn device with the aim of parallel RC methodology for the equivalent circuit analysis. Such a route will certainly provide an insight into how such devices can be optimized further. On one hand Nyquist plots associated with Einstein's displayed a similar behavior as compared to that of parallel RC circuit. This clearly represents the contribution of C_∞ is negligible. However, the magnitude of the spur decreases as R_p increases and is observed to be shifting towards lower values of C' . Further decreasing in C_∞ resulted in a distinct gap among the spurs against increasing R_p . Yet on the other hand absolute value of C decreased linearly with a negative slope in the frequency range 10^{-3} - 10^{-1} rad/s followed by a sharp twisting. It kept almost zero beyond. Increasing the values of R_p resulted in a similar behavior but lower in magnitude. The plots of loss angle, δ against ω as a variation of R_p displayed a shoulder followed by a fall-off as ω^{-1} due to capacitive effects. Conversely, Cole-Cole plots consist of a distinct semicircle corresponding to a parallel combination of conductance and a dispersive capacitance in Debye's. No any vertical spur is observed. In addition, the modules of capacitance, C versus frequency, f for the Debye's circuit showed a cut-off as ω^{-1} , and beyond saturates to zero. This suggests that capacitance behavior is more dominant. Moreover, the loss angle, δ displayed a broad band around a maximum of which shifted to lower frequencies as R_p increases. This is broadly consistent with what is normally reported and as yet it is generally understood in terms of the relaxation time.

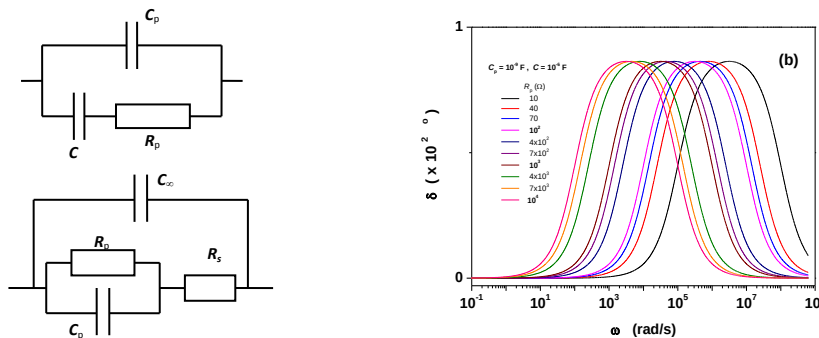


Fig. 1: (a) Debye & Einstein's equivalent circuit and (b) Bode plot.

Oxygen Ion Conductivity and Structure Properties of Bi - Based Ternary System

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The Samarium (III) oxide and Ytterbium (III) oxide doped Bismuth trioxide solid solutions, the $(\text{Bi}_2\text{O}_3)_{1-x-y}(\text{Sm}_2\text{O}_3)_x(\text{Yb}_2\text{O}_3)_y$ ternary system were synthesized with $x=10,15$ mol % and $y=5, 20$ mol % dopant concentrations in air atmosphere with solid state reaction. Temperature dependent electrical conductivity of the samples have been investigated by 4-point probe technique by heating and cooling proses. It has been found that, the materials of solid electrolyte systems are good oxygen anions O^{2-} conductivity. Crystal structure of the $(\text{Bi}_2\text{O}_3)_{1-x-y}(\text{Sm}_2\text{O}_3)_x(\text{Yb}_2\text{O}_3)_y$ has been determined by X-ray powder diffractions (XRD) measurements before and after electrical conductivity measurements of the samples. Surface and grain structure properties of the samples were determined by SEM analysis. It has been concluded that the samples can be used as electrolytes of the solid oxide fuel cells (SOFC).

The interface state density distribution from capacitance and conductance-frequency characteristics of Au/p-Si Schottky device with perylene-diimide interlayer

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Au/perylene-diimide (PDI)/p-Si Schottky device has been fabricated by depositing a PDI layer on p-type Si by using the spin coating method. In order to obtain the interface state density and its relaxation time of the device, the frequency dependent capacitance–voltage ($C-V-f$) and conductance–voltage ($G-V-f$) characteristics of the device have been investigated in the frequency range of 1 kHz – 1 MHz and the voltage range of 0 V – 0.65 V. The capacitance values obtained from $C-f$ measurements have shown a decrease but the conductance values obtained from $G-f$ measurements have an increase with increasing frequency. The interface state density ranges from $1.574 \times 10^{12} \text{ eV}^{-1} \text{ cm}^{-2}$ in 0 V to $5.394 \times 10^{12} \text{ eV}^{-1} \text{ cm}^{-2}$ in 0.65 V. Furthermore, the relaxation time ranges from $4.38 \times 10^{-7} \text{ s}$ in 0 V to $4.13 \times 10^{-6} \text{ s}$ in 0.65 V.

Dielectric and ac conductivity properties of perylene-monoimide layer prepared by using spin coating method on n-type Si (100) substrate

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Au/perylene-monoimide (PMI)/n-Si structure has been obtained by forming a PMI layer on n-type Si by using the spin coating method. In order to determined the values of real and imaginary dielectric constant, tangent loss, electrical modulus and ac conductivity of the structure, the capacitance and conductance characteristics of the structure have been investigated in the frequency range from 30 kHz to 1 MHz and voltage range from –1 V to 1 V. It is shown that the values of real dielectric constant (ϵ') of the structure show a peak and its intensity decreases with increasing voltage and also shifts towards the higher voltage side with increasing both voltage and frequency. Furthermore, it is found that the values of the real and imaginary dielectric constant, tangent loss decrease with increasing frequency while an increase is observed in ac conductivity and the real and imaginary component of the electrical modulus.

Effect of isothermal annealing time on ac conductivity and dielectric properties of Au/n-Si Schottky diode with SnO₂ interlayer

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Au/SnO₂/n-Si diode has been fabricated by forming a tin oxide (SnO₂) layer on n-type Si by using the spin coating method. Some physical properties, such as ac conductivity, dielectric constant, tangent loss and electrical modulus of Au/SnO₂/n-Si Schottky diodes, have been investigated before and after different annealing time. The dielectric properties of the diodes were determined from capacitance-voltage (C-V) and conductance-voltage (G-V) measurements at a frequency of 1 MHz and at room temperature. The dielectric properties of the diodes have been found to be strongly influenced by the thermal annealing time. Experimental results show that the isothermal annealing time is an effective way to increase the dielectric constant and to decrease the dielectric loss of electronically devices such as Au/SnO₂/n-Si diodes. For example, the ϵ' have values of 6.97, 9.50, 10.25 and 11.44 at +1V for the samples as-processed, 60, 180 and 300 min annealed, respectively. The ϵ'' has values of 12.53, 6.88, 4.61 and 3.21 at +1V for the samples as-processed, 60, 180 and 300 min annealed, respectively. In addition, the values of ac conductivity showed a strong dependence on the applied voltage and decrease with annealing time at room temperature.

Effect of isothermal annealing time on electrical properties of Schottky diodes based on tin oxide film prepared by spin coating technique

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Tin oxide (SnO₂) films has been deposited on n-type Si substrate with spin coating technique. The electrical properties of Au/tin oxide/n-Si Schottky diode have been investigated by current-voltage (I-V) and capacitance-voltage (C-V) measurements at different annealing times. An effective barrier height as high as 0.768 eV (I-V) and 0.772 eV (C-V) is achieved for the Au/tin oxide/n-Si diode after 180 min annealed compared to the as-deposited and at 60 and 300 min annealed. We have also applied the Norde method modified by Bohlin to calculate the barrier height and series resistance. Results show that the most value of barrier height has after annealing at 180 min and then slightly decreases after annealing at 300 min while series resistance increase with increasing annealing time. The energy distribution plots of the interface state density for all annealing times are obtained from experimental data of the forward bias I-V curves. The interface state density of the diodes has an exponential decrease with bias towards the bottom of the conductance band for isothermal annealing time; for example, from $8.7 \times 10^{11} \text{ eV}^{-1} \text{ cm}^{-2}$ in -0.45 eV to $2.66 \times 10^{11} \text{ eV}^{-1} \text{ cm}^{-2}$ in -0.71 eV for the as-deposited sample and from $1.03 \times 10^{12} \text{ eV}^{-1} \text{ cm}^{-2}$ in -0.570 eV to $4.75 \times 10^{11} \text{ eV}^{-1} \text{ cm}^{-2}$ in -0.719 eV for the sample annealed 300 min. It is found that the diode parameters change with increasing annealing time.

The Production of Magnetic Nanoparticles and Study their Effect on the Properties of Carbon Nanotubes

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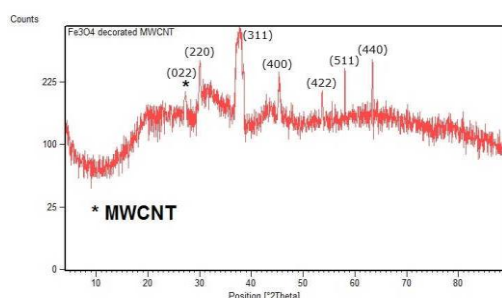
Carbon nanotubes have different areas of applications at industries such as semiconductors. We can amplify the electrical properties of carbon nanotubes with appropriate routes. In order to combine the utilities of multiwalled carbon nanotubes and Iron oxide nanoparticles, different methods are used. In this investigation, we want to cover the multiwalled carbon nanotubes by Fe₃O₄ nanoparticles using Co-precipitation method.

Table(1) the magnitudes of FWHM and Height of Fe₃O₄/MWCNT

Pick number	Height	FWHM	Size
1	46.68	0.4723	12
2	112.94	0.2362	19
3	75.40	0.3936	5
4	64.62	0.2362	8
5	93.24	0.2362	10
6	135.87	0.1440	30

Table(2) magnetic magnitudes of samples

Sample	M _s (emu/g)	M _r (emu/g)	H _c (Oe)	property
Pristine MWCNT	0.15	0	10	superparamagnetic
Opened MWCNT	0.19	0	10	superparamagnetic
Decorated MWCNT	1.50	0	0	superparamagnetic



Picture(1) the XRD diagram of Fe₃O₄/MWCNT

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The effect of tunneling enhanced recombination current on interface state density for Graphene/a-Si:H structure

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The diodes are one of most important and smallest cell in the electronic circuitry. The nonlinear behavior of these components and their ability to control electron flows make rectification of any signals or amplification of weak signals possible, and is usually applied to information and signal processing. To understand their operation principle under different physical condition is quite important issue because it allows researchers to dramatically reduce the development costs and time-to-market. Especially Graphene is quite famous and valuable material in the use of device application due to the abundance of the Graphene. Recently physicists show electrons can move more than 100 times faster in Graphene. In that frame Graphene has become most used metal electrode in the device application so far. However, the temperature dependent dark current voltage characteristics of Graphene/a-Si:H device structure are still unknown. The performance and stability of these devices are especially dependent on the interface state density. The temperature dependent forward bias current-voltage characteristics of Graphene/a-Si:H device are considered to behave like the Schottky junctions where carrier injection is especially influenced by the tunneling enhanced recombination current. However, the exact location of the mentioned mechanism plays crucial role to figure out the interface state density values. Therefore, we have investigated interface state density comparison of the tunneling enhanced recombination current depending on the bulk and interface for Graphene/a-Si:H device structure with simulation.

Simulation programme about barrier height inhomogeneity effect for Au/n-GaN device

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Randomly distributed dopand atoms within the semiconductor, atomic steps and lattice defects at the interface, the relative orientation of semiconductor and metal atoms, grain boundaries in the metal, interface roughness bring electronical problems. These electronical problems lead to spatially varying device parameters [1-3]. Understanding the nature of spatial inhomogeneity effect on the device performance will be a vital endeavor in the near future for improvement of devices [4]. Numerical modeling of devices by two-dimensional (2D) models is an approximation for investigating spatially inhomogeneous devices. In this study, local barrier height fluctuating effect on the current-voltage characteristics of the Au/n-GaN device has been studied by 2D simulation software developed in our group. During the simulation process, Au/n-GaN device is interpreted based on the existence of the randomly distributed barrier height inhomogeneities. Percentage deviation from barrier height value is representing as fluctuating factor in this study. We have found a strong correlation between barrier height fluctuating factor and illuminated current voltage characteristics of Au/n-GaN device. Simulation results of Au/n-GaN device showed that V_{oc} , fill factor, and efficiency decrease with increasing barrier height fluctuating factor.

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Preparation and Characterization of Li doped and undoped ZnO thin films by spin-coating technique

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ZnO is extensively studied because of its potential applications in different areas such as solar cells, light emitting diodes, and nanotechnology[1-2]. In this study undoped and Li doped ZnO thin films were deposited on glass substrate by spin-coating sol-gel technique. Li doped ZnO thin films were coated on glass (1x1cm²) substrate by sol-gel spin coating technique. The crystal characterization and Li doping effect on the crystal structural properties of ZnO thin films were carried out by X-ray diffraction measurements, the morphological properties of the samples were evaluated by Scanning Electron Microscope (SEM). From the XRD data, we observed that the strongest diffraction peak for all the films was (101) and (002) respectively. All samples have hexagonal ZnO crystal structure and there is no impurity peak such as Li in the films. From other studies we know that the amount and variety of dopant effect on the surface morphology [3]. According to the SEM images, we can clearly observe that the surface morphology of the films is affected by the Li dopant.

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High transparent and low resistance ITO thin film on PET Sheet grown by ionized physical vapor deposition technique

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Currently, the interest of bendable or wearable electronic device is gradually increased due to i-watch (APPLE). These devices are based on flexible electronic device fabrication technique and unbreakable touch panel technique. Commercialized touch panels were usually used a transparent electrode as indium tin oxide (ITO) layer. It is very important that electrical resistivity and transmittance of transparent electrode deposited on the flexible plastic substrate. Therefore, we deposited ITO thin film on flexible substrate, polyethylene terephthalate (PET), via ionized physical deposition (IPVD) method and investigated its electrical resistivity and optical transmittance. Then, the IPVD technique is kinds of modified induction coupled plasma (ICP) and RF magnetron sputtering methods. The IPVD technique makes high transmittance and low resistance ITO thin film due to high plasma density and indirectly heating effect. We investigated the ITO films in terms of the effect of ICP and RF power, oxygen partial pressure, deposition pressure and various post annealing conditions. And also their surface morphological, electrical and optical properties were characterized by atomic force microscope (AFM), 4 point probe, and UV-vis. spectrometer, respectively. After 130°C annealing, IPVD deposited ITO film (30 nm) /PET has the sheet resistance of 90 $\Omega/\square$ and transmittance of 87% (at 550 nm). In addition, we compared the properties of ITO films with/without index matched structure. We present the detailed experiment results and other analysis results of ITO films with deposition conditions.

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Effect of Washing in Ethanol of Porous Silicon on Efficiency of Porous Silicon Based Fuel Cells

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The objective of the paper is to report results on performance characteristics Au/Porous Silicon/Silicon fuel cells using microporous silicon as proton conducting membrane and gold as catalyst layer. Porous silicon layer has been prepared on n-type single crystalline silicon wafer using the anodic etching under illumination. Porous Silicon/Silicon samples were aging in ethanol and then the samples were coated Au catalyst layer onto the PS layer. The performances of the Au/Porous Silicon/Silicon fuel cell were measured before and after ethanol washing to study the effect of ethanol washing. Also to study the washing effect, a comparison was made between as prepared samples and after washing. The effect of ethanol adsorption in porous silicon has been studied by FTIR and ESR spectroscopy.

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Illumination intensity effects on the dielectric properties of Schottky Devices with Co, Ni-doped PVA nanofibers as an interfacial layer

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The illumination intensity and gate voltage effects on the dielectric properties of Au/PVA(Co,Ni -Doped)/n-Si SDs have been studied in detail by using admittance spectroscopy method at room temperature. The Au/Poly (vinyl alcohol) (Co, Ni-doped)/n-Si Schottky devices (SDs) were fabricated using n-type single crystal silicon (phosphor-doped). The ohmic and rectifier contacts were thermally formed by annealing them in evaporating system. PVA/(Co-Ni) nanofiber film was used as an interfacial layer between metal-semiconductor. After the PVA/(Co-Ni) acetate was obtained, the nanofiber film was fabricated on silicon wafer using electrospinning technique. The dielectric properties of Au/PVA (Co,Ni-Doped)/n-Si SDs were investigated in the gate voltage range of (-1.5)-(+1.5) V before and after various illumination levels at 1 MHz. The dielectric constant (ϵ'), dielectric loss (ϵ''), dielectric loss tangent ($\tan \delta$), the ac electrical conductivity (σ_{ac}) and the real and imaginary parts of electric modulus (M' and M'') were obtained from the measured capacitance and conductance values [1]. Experimental results show that the values of the dielectric parameters in dark and under illumination were different from each other. Also, these parameters were found to be functions of illumination intensity and gate voltage. Such illumination level-related behavior of dielectric parameters can be explained on the basis of Maxwell–Wagner interfacial polarization and restructuring and reordering of charges at interface states [2].

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Structral, Optical and Electrical Properties of $\text{Cd}_{1-x}\text{Co}_x\text{S}$ Thin Films Prepared by Chemical Bath Deposition Method

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$\text{Cd}_{1-x}\text{Co}_x\text{S}$ thin films were deposited on glass substrate by chemical bath deposition method. The effect of Cobalt doping on the structural, optical properties and electrical of CdS thin film was investigated. The thickness of the samples decreased from 152 nm to 130 nm with Co doping. X-ray diffraction studies showed that all films have some amorphous component and crystallinity of CdS sample was deteriorated by Co doping. It was determined from scanning electron microcopy micrographs that the surface of the samples had some voids. Optical transmittance of the Co doped samples was lower than that of the undoped sample. The band gap decreased from 3.97 eV to 3.85 eV and the sub-band gap increased from 2.37 eV to 2.41 eV with the increase of Co content. It was observed from photoluminescence spectra that all samples have two broad peaks around 400–500 nm and 520–700 nm. The dark resistivity increased from 29.5 $\Omega\text{-cm}$ to $1.65 \times 10^3 \Omega\text{-cm}$ and the carrier concentration decreased from 1.86×10^{15} to $2.21 \times 10^{14} \text{ cm}^{-3}$ as the Co content increased.

Interactions Between Coumarin 151 and Colloidal CdS Semiconductor Particles in Aqueous Solution

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Colloidal semiconductor particles are materials whose their sizes can be changed with the methods of syntheses. Their optical properties depend on their size due to quantum confinement [1,2]. Therefore, II–VI group semiconductor compounds are widely used in light emitting diodes, photovoltaics, and solar cells. CdS is a suitable material for solar cell applications due to band gap energy, stable structure and low cost [2,3]. In our work, different particle size of colloidal CdS semiconductor was synthesized and average particle sizes were determined as ~4 and ~8 nm by transmission electron microscope (TEM). Tauc equation was used to determine the band gap energy values of colloidal CdS semiconductor particles [4]. Band gap energies of the colloidal CdS semiconductor particles were found to be as 2.60 eV and 2.54 eV for ~8 and ~4 nm respectively. Moreover, absorption spectra of two different sizes of colloidal CdS semiconductor particles were taken by UV-Vis absorption spectrophotometer. Electronic absorption spectra indicated that the smaller the particle sizes of CdS the higher the band gap energies due to quantum size effect [5]. Interactions between fluorescent organic dye compound, coumarin 151 (C151), and colloidal CdS semiconductor were investigated in aqueous solution by using spectroscopic techniques. Concentration of C151 (1.0×10^{-6} M) was kept constant as the concentration of colloidal CdS semiconductor was increased in solution. It was observed that fluorescence emission from C151 molecules was quenched. The same situation was observed in case of both particle sizes of colloidal CdS semiconductor in solution. Fluorescence quenching of C151 compound by colloidal CdS semiconductor has been evaluated by Stern-Volmer (S-V) equation [6,7]. In addition, it was seen that fluorescence quenching process is independent of temperature with the help of S-V equation. Interfacial electron transfer between C151 and the semiconductor colloidal CdS particles was further studied by using ESR spectroscopy under steady-state UV irradiation. ESR spectra of the samples recorded under with and without steady-state UV irradiation and were seen an average 5 gauss of a peak on the spectra that implies there is a photoinduced-electron transfer process between C151 and the semiconductor colloidal CdS particles in solution [7,8].

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An Organic-Inorganic Rectifying Contact Based on a ZnPc Derivative

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An organic-inorganic rectifying contact was formed by forming a thin film of one of the ZnPc derivatives, Zinc (2,3,9,10,16,17,23,24-Octakis(octyloxy)-29H,31Hphthalocyanine) (oc-ZnPc), on a p-Si wafer and evaporating Al on the structure. The current-voltage (*I*-*V*) and capacitance-voltage (*C*-*V*) measurements of Al/ocZnPc/p-Si structure were taken under dark at room temperature. The *I*-*V* measurements proved that the structure showed excellent rectification. Some basic diode parameters like ideality factor and barrier height were calculated from $\ln I$ -*V* plot. Ideality factor and barrier height were found as 1.44 and 0.78 eV, respectively. The series resistance value of the structure was determined as 5.46 k Ω by means of Norde functions. The *C*-*V* measurements were taken for various frequencies and it was seen that the capacitance value decreased with increasing frequency.

In addition *I*-*V* measurements of the Al/oc-ZnPc/p-Si were repeated under light which had illumination intensity of 40-100 mW/cm². It was observed that reverse bias current of the diode increased with the light intensity. Therefore, the structure showed photodiode characteristic and it can be used in electrical and optoelectronic applications.

Key Words: Schottky Diodes, Zinc Phthalocyanine, Norde Function, Series Resistance

UV Light Activated Gas Sensor For NO₂ Detection

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In this work, UV light activated gas sensor was investigated for Al/Al₂O₃/p-Si and Al/TiO₂/Al₂O₃/p-Si samples by atomic layer deposition method. Generally, to obtain the sensing performance, traditional metal oxide semiconductor gas sensors are operated at of 100-400 °C. However, This temperature range limits their applications to flammable gases, and causes high power consumption. It is important to note that sensing performance experiments should have been performed at the room temperature. With the support of UV light, gas sensors do not need to be heated and they can work at room temperature easily. For this purpose, electrical measurements have been performed on sensing performance with and without UV irradiation for detection NO₂ gas. With UV irradiation, we obtained good sensitivity at the room temperature for Al/TiO₂/Al₂O₃/p-Si structure but under the same conditions no result was obtained for Al/Al₂O₃/p-Si structure. Without UV irradiation, there was no sensitivity for both structures. We observed that increasing of sensitivities at the room temperature show a direct effect of the light on the adsorbed oxygen ions. According to the relation of photocatalytic reaction and photoactivated gas sensing process, we concluded that TiO₂ might be an acceptable sensor for detection of NO₂ at room temperature under the illumination of UV irradiation.

Determination of $K\alpha$ X-ray Production Cross Sections and $K\beta/K\alpha$ Intensity Ratios for Ba, La, Ce and Gd Elements Excited with Photons of 0,0208 Nanometer Wavelengths

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$K\alpha$ X-ray production cross-sections and $K\beta/K\alpha$ intensity ratios are important in a variety of fields such as atomic physics, molecular physics, space physics, plasma physics, X-ray fluorescence analysis, medical research, environmental protection and industrial processing [1]. The $K\alpha$ X-ray production cross-sections and the $K\beta/K\alpha$ intensity ratios of Ba, La, Ce and Gd elements were determined with experimentally and theoretically. The targets were irradiated with photons of 0,0208nm wavelengths. It has been observed that the obtained values in the present study agree with theoretical results and other available experimental values.

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The L_{III} Subshell X-ray Production Cross Sections of Yb, Hf, Ta and W elements at Photons of 0,0208 Nanometer Wavelength

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Study of the L_{III} subshell X-ray production cross sections are important for understanding the complex processes involved in the inner-shell ionization and also provide a testing ground for the available theoretical models explaining these processes. The reliable and accurate data on the L_{III} X-ray production cross sections are important in atomic and molecular physics, qualitative and quantitative element analysis using XRF (X-ray Fluorescence) technique and medical physics. The L_{III} X-ray production cross-sections of Yb, Hf, Ta and elements were determined with experimentally and theoretically. The targets were irradiated with photons of 0,0208 nm wavelength. It has been observed that the obtained values in the present study agree with theoretical results and other available experimental values.

SiC Gas Sensor For NO₂ Detection

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In this work, Ni/6H-SiC/Ni-Au Schottky diode was fabricated and investigated as a gas sensor. The gas sensing performance was operated at the temperature range of 300-500 K. Increasing of the hazardous gases or other chemicals into the environment have led to the increased attention on development of advanced sensors. The wide bandgap semiconductor silicon carbide (SiC) is an attractive candidate for these applications due to the possibility of device much higher operated temperatures than many of the traditional semiconductors. There is a strong interest of SiC-based gas sensors for gas sensing in harsh, high temperature environment and could be used for high power electronics applications. Towards this purpose, Electrical measurements have been performed on sensing performance at the temperature range of 300- 500 K. We obtained acceptable sensitivity at 400 K and then the sensitivities increases with increasing temperature due to much more gas molecules dissociate and show a direct effect of the temperature on the adsorbed oxygen ions. According to the gas reaction and gas sensing process, we concluded that Ni/6H-SiC/Ni-Au might be an acceptable sensor for detection of NO₂.

Investigation of current-voltage-temperature characteristics in Al/p-Si Schottky diode with the polythiophene-SiO₂ nanocomposite interfacial layer

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The current-voltage (I - V) characteristics of the prepared Al/Polythiophene-SiO₂/p-Si Schottky diode have been investigated by using conventional I - V method in wide temperature range. The ideality factor of Al/Polythiophene-SiO₂/p-Si Schottky diode has decrease with increasing temperature and the barrier height has increase with increasing temperature. The fitting of $\Phi_{bo}(T)=AT^2+BT+C$ for the barrier height versus temperature data gives $A = -2 \times 10^{-6}$ eV/K², $B = 3.2 \times 10^{-3}$ eV/K, and $C = -0.035$ eV. The activation energy and effective Richardson constant have been calculated as 0.16 eV and 1.79×10^{-8} Acm⁻²K⁻² from linear part of Richardson plot, respectively.

Optical properties of Cd(OH)₂ thin film synthesized using the arc discharge method

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The optical constants of thin film prepared by cadmium hydroxide nanoparticles spray coated on the glass substrate held about at 100 °C temperature have been investigated using the optical transmission and reflection spectra. The transmission spectrum exhibits that the film has a high transparency (~80 %) at the infrared region. From standard optical analysis, direct band gap energy of Cd(OH)₂ was found as 3.13 eV, and also, it was seen that the calculated refractive index varies between 1.65 and 2.15 throughout the spectral region considered.

On The Current-Voltage Characteristics of Au/n-InP/In Diode at Low Temperature

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Au/n-InP/In diode has been fabricated in the laboratory conditions and the current-voltage characteristics of the diode have been measured in the temperature range 200–300 K with 10 K steps. The evaluation of the experimental current-voltage data reveals a decrease of the barrier height and an increase of the ideality factor with decreasing temperature. The ideality factor and barrier height values which obtained from current-voltage curves have been found to be strongly temperature dependent and this behavior has been attributed to barrier inhomogeneities at the metal–semiconductor interface.

The Effects Of Thermal Annealing On The Current-Voltage Characteristics Of Au/n-InP/In Diode

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Au/n-InP/In diode has been fabricated in the laboratory conditions and the current-voltage characteristics of the diode have been measured in the room temperature. In order to observe the effect of the thermal annealing, this diode has been annealed at temperatures 100 and 200 °C for 3 min in N₂ atmosphere. The characteristic parameters such as leakage current, barrier height and ideality factor of this diode have been calculated from the forward bias current-voltage characteristics as a function of annealing temperature.

Fabrication and Electrical Characterization of Au/Pyronine-G/p-Si Diode

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Au/ Pyronine-G /p-Si heterojunction was fabricated via solution-processing method. The current–voltage and the capacitance–voltage characteristics of the heterojunction diode were measured at room temperature. It was seen that a rectifying behavior from the current–voltage characteristics and the current in the reverse direction was increased by light-illumination. The characteristic parameters of the device such as barrier height, ideality factor and interface states density were determined from the current-voltage measurements. Also, Norde method was used to evaluate the current-voltage characteristics. From the dark current-voltage characteristics, the values of ideality factor and barrier height of the device were calculated as 1.36 and 0.78 eV, respectively. It was seen that this barrier height value calculated for the Au/Pyronine-G/p-Si heterojunction diode was significantly larger than the value of conventional Au/p-Si Schottky diodes at room temperature. The energy distribution of the interface state density determined from the current-voltage characteristics increased exponentially with bias from $1.05 \times 10^{10} \text{ eV}^{-1} \text{ cm}^{-2}$ at $(0.74 - E_V) \text{ eV}$ to 1.19×10^{12} at $(0.49 - E_V) \text{ eV}^{-1} \text{ cm}^{-2}$. The barrier height and acceptor carrier concentration values for the Au/Pyronine-G/p-Si heterojunction diode was extracted as 0.92 eV and $9.35 \times 10^{14} \text{ cm}^{-3}$ from linear region of its the capacitance–voltage characteristics at 1 MHz, respectively.

Characterization of SnS Thin Films Grown by SILAR Method

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Polycrystalline SnS thin film was prepared onto glass substrate by SILAR method at room temperature, using the tin sulfate and sodium sulfide aqueous solutions as precursors. The film thickness was measured using ellipsometry. The structural, surface morphological and optical properties of the as deposited film were investigated via X-ray diffraction, scanning electron microscopy and optical absorption measurements respectively. X-ray diffraction studies confirmed the polycrystalline nature of the film and some structural parameters such as grain size, dislocation density, strain and number of crystallites per unit surface area of the SnS thin film were also evaluated. From the scanning electron microscopy measurements the film found to be relatively smooth and uniform. With the help of optical absorption measurements band gap of the SnS thin film was estimated as 1,45 eV.

The effect of cadmium concentration on structural, optical and dielectric properties of $\text{Cd}_x\text{Zn}_{1-x}\text{O}$ thin films

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$\text{Cd}_x\text{Zn}_{1-x}\text{O}$ ($x=0, 0.25, 0.50, 0.75, 1$) thin films were grown on glass substrates using Successive Ionic Layer Adsorption and Reaction (SILAR) method at room temperature and ambient pressure. The cadmium concentration (x) effect on the structural, morphological and optical properties of $\text{Cd}_x\text{Zn}_{1-x}\text{O}$ thin films was investigated. The X-ray diffraction (XRD) and scanning electron microscopy (SEM) studies showed that all the films exhibit polycrystalline nature and are covered well with glass substrates. The crystalline and surface properties of the films improved with decreasing cadmium concentration. The energy bandgap values were changed from 2.28 to 3.22 eV depending on the cadmium concentration. The refractive index (n), optical static and high frequency dielectric constants ($\epsilon_0, \epsilon_\infty$) values were calculated by using the energy bandgap values as a function of the cadmium concentration.

Synthesis and Characterization of Na-doped CdS Films

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Deposition of undoped and 1%, 2% and 3% Na doped CdS films were fabricated by Chemical Bath Deposition (CBD) method. XRD diffraction patterns showed that an increase of NaCl in the solution leads destruction on the reflection peak of (002) plane belongs to hexagonal structure. The SEM images of the samples exhibited a decrease in grain size (6.2 - 4.1 nm). Additionally, the increase of Sodium in the structure eventuated in more optically transparent CdS films. The calculated values of band gap (E_g) obtained from $(\alpha h\nu)^2$ versus photon energy graph by using the absorption spectra data were raised from 3.62 to 3.88 eV values depending on Sodium. The resistivity of CdS films, measured via Van der Pauw method, showed an increase related to NaCl concentration but a decrease in light sensitivity was detected. It was understood by EDX analysis that the augment in resistivity values according to the NaCl concentration is caused by more addition of the acceptor featured Chlorine atoms.

Preparation and Polymerization of Chalcone Substituted Aniline and Investigation of Electro-optical Properties

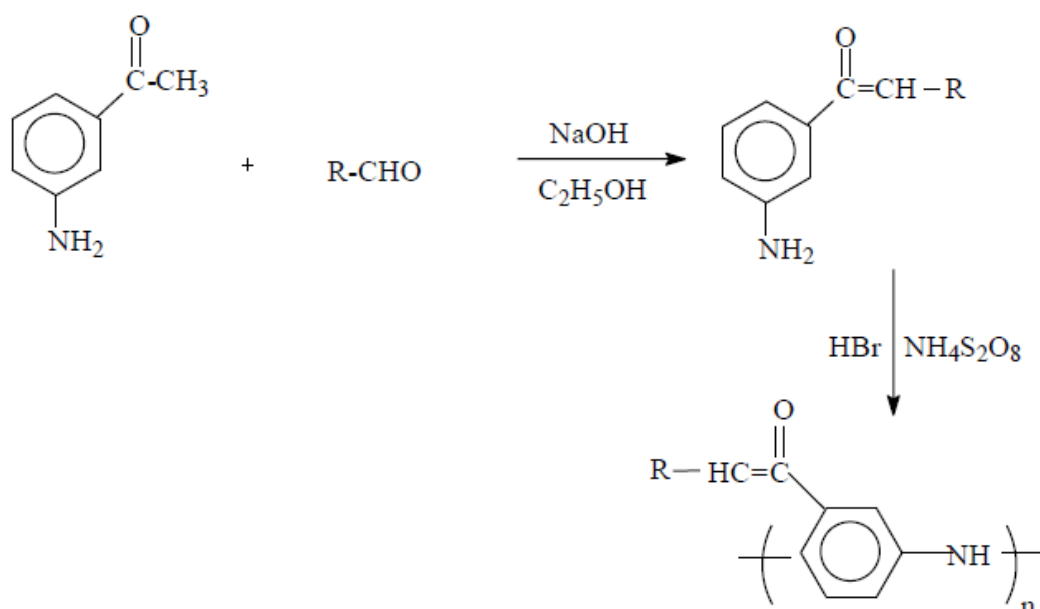
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Polyaniline (PANi) has received an enormous amount of research attention, because it has very interesting and useful physical properties for the practical fabrication of an electrical all-organic device, as well as remarkable tensile properties. Therefore, it is important to modifying the conductivity and processability of PANI through the selection of a suitable dopant and suitable level of doping and also by controlling its structure during synthesis [1,2]. Photosensitive polymers with photocrosslinkable groups have gained a considerable interest in recent years owing to a wide variety of applications in the field of macro- and microlithography, printing, liquid crystalline display, nonlinear optical materials, holographic head-up-display, integrated circuit technology, photocurable coatings, photoconductors, energy exchange materials, etc [3]. In this study, 3-aminoacetophenon was reacted with aldehydes to obtain chalcon substituted aniline derivative. Polymerization of the chalcon based monomer was carried out HBr as dopant and NH₄S₂O₈ as oxidant. Electro-optical Properties of the polymer was investigated.



Scheme 1. Preparation of chalcon substituted polyaniline

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Newly emerging simulation and experimental investigations for surface characterization with desorption electrospray ionization mass spectrometry

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Desorption Electrospray Ionization Mass Spectrometry (DESI MS) is rapidly becoming accepted as a powerful surface characterization tool for a wide variety of semiconductor and polymer samples in the open air and vacuum. Besides its well-established high-throughput capabilities, a unique feature of DESI MS is that chemical reactions between the charged spray micro droplets and surface molecules can be exploited to enhance ionization. This work deals with simulation and experimental investigations of DESI MS performance of microfluidic devices for surface characterization of semiconductor and polymer. A numerical model is presented that is used for simulating the ion guide systems. The ion guide systems breakup was simulated by SIMION. SIMION is a software package primarily used to calculate electric fields and the trajectories of charged particles in those fields when given a configuration of electrodes with voltages and particle initial conditions, including optional RF, magnetic field and collisional effects. The main limitation on DESI MS technique is the obtainable resolution where the two main limiting factors are the initial space and energy spread of particles created in ionization region. We have presented principles of DESI MS analytical methods and ray-tracing simulation. This work aims understanding of ion optical system clearly and gives hint of expectation for future developments on DESI MS apparatus.

Electrical Properties of Al/CZTSe Nanocrystal Schottky Diode

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Cu₂ZnSnSe₄ (CZTSe) nanocrystals have been manufactured by using hot injection technique. CZTSe nanocrystal thin film is produced on ITO coated glass by spin coating method. Next, Al dot contacts were made. Some physical properties, such as ideality factor (n), barrier height (Φ_B), density of states (DOS), series resistance (R_s) have been determined using current-voltage (I-V) measurements. The I-V measurements have performed for Al/CZTSe/ITO Schottky diodes in the temperature range of 100 K to 325 K. The ideality factor and barrier height of the diodes have been found to be strongly influenced by the temperature. The n was found to lie between 11.1 and 3.6. The initial value of Φ_B is 0.194 eV at 100 K and the rate of increase with increasing temperature becomes faster and reaches a value of 0.624 eV at 325 K. The obtained DOS value at 325 K is lower than the value at 100 K. The series resistance were investigated as a function of temperature and slightly reduced with increasing temperature.

Deep Defects Study in CIGSe Based Thin Film Solar Cells By DLTS Spectra in Different Metastable Conditions

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In this work deep level transient spectroscopy (DLTS) and reverse-bias DLTS (RDLTS) methods [1] were used to investigate defects in the bulk and at the interface of heterojunction Cu(In,Ga)Se₂- based thin film solar cells. Samples with varied stoichiometry (Cu/III) and Ga content were examined. A special attention was paid to persistent changes in defect spectra under different kind of illumination or reverse bias voltage. A careful analysis and comparison with a literature data allowed us to distinguish 4 different components of the so-called N1 signal. Some of them have been detected previously by admittance spectroscopy [2,3]. We have proposed that some of the signatures belonging to the N1 family can be related to traps in the bulk CIGSe. On the other hand we discuss the components which emission rates shift under light soaking and reversed bias as being related to the response of traps located in the vicinity of the CdS/CIGSe interface.

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Effect of F-doping On Structural, Electrical and Optical Properties Of NiO Thin Films

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NiO and Fluorine doped NiO films were produced by airbrush spray deposition technique. All films were prepared onto glass substrates at 400 °C and annealed at 550°C. In this work, we present analysis of the structural, morphological, electrical and optical properties of the obtained films. X-ray diffraction spectra have revealed that crystal structures of the films were cubic. The grain size of the films was varied in the range, 14 – 35 nm. Morphology of the films was examined by using a scanning electron microscopy (SEM). Optical measurements show that the band gap energies of the films vary with Fluorine concentrations. Resistivities of the films were determined by four point method and the changes in resistivity with Fluorine concentration are investigated.

Detection of Mismatched *NRAS* Gene Using Fluorescence Quenching of Quantum Dots In a Microfluidic Chip

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The mutations in *NRAS* gene occur in approximately 20% of all human cancers. The early detection of a mutated *NRAS* gene can be used for the diagnosis of cancer and gene therapy. In our previous studies, various specific DNAs could be detected through fluorescence quenching of quantum dots (QDs) [1-3]. QDs are nano scale semiconductors which have various peculiar electrical and optical properties. Polystyrene beads and magnetic beads were used as the support for quantum dots conjugated with probe DNAs. After hybridization, fluorescence quenching of QDs by intercalating dye was used for the detection of target DNAs. In this study, single base mismatched *NRAS* gene was detected through fluorescence quenching of quantum dots in a microfluidic chip. The fluorescence quenching rate of QDs was depending on the number of mismatched bases. The fluorescence quenching was monitored by a fluorescence microscope and the intensity variation was investigated through image analysis. The dependence of the flow rate and concentration on the fluorescence quenching was also investigated.

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Capacitance–Voltage Characteristics Of Ni/Au/n-GaN Contacts

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Ni/Au/n type GaN structure has been characterized by current-voltage and capacitance-voltage methods at room temperature. Cheung's functions and thermionic emission (TE) were used to calculate diode parameters. We calculated the characteristic parameters of the Schottky contacts (SCs) such as Schottky barrier height (SBH), ideality factor (n) from the C–V measurements. The measurement frequency ranges from 100 kHz to 1 MHz. It has been seen that the measured capacitance decreases with increasing frequency due to a continuous distribution of the interface states in the frequency range of 100 kHz to 1 MHz at room temperature.

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Pulsed Dc Sputtered Cr/P-Inp Schottky Barrier Diodes

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Cr/p-InP Schottky barrier diodes were fabricated by pulsed DC sputtering of Cr metal on p-InP semiconductor. It was seen that the diode had excellent rectification behavior and obey the thermoionic emission theory. The electrical parameters of the diodes such as ideality factor, barrier height and series resistance values were determined using the functions proposed by Cheung and Norde. The I-V measurements of the structure were also performed under a solar simulator with AM1.5 filter and 100 mW/cm² illumination intensity. Furthermore, the capacitance-voltage (C-V) measurements of Cr/p-InP diode were carried out at various frequencies. The barrier height value obtained using C-V values was compared with the one obtained using I-V data.

Effects Of The Radiation On Al/Organic Film/P-Silicon Semiconductor Diode

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The knowledge of the influence of radiation damage on the Schottky barrier diodes (SBDs) performance is a fundamental field of research, having technological relevance for many applications in the semiconductor electronic devices [1]. Hence, it is very much essential to evaluate the effect of irradiation and identify the degradation mechanism to understand the failure mechanisms [2]. Recently, several groups have investigated the effect of gamma-ray irradiation dose on the electrical characteristics of metal/semiconductor or metal/interlayer/semiconductor (MIS) structure [3-10]. Zainninger et al. [5], Ma [6] and Winokur et al. [7] were among the pioneers who made systematic observations on the irradiation behavior of radiation induced interface traps in the MIS devices. Especially there are two important effects of radiation to be considered: (a) transient effects due to the electron-hole pair generation and (b) permanent effect due to the bombardment of devices with radiation, causing changes in the crystal lattice [8,10]. In this work, we report on the electrical characteristics of the Al/methyl violet/p-Si Schottky diode irradiated by Ba-133 source with activity of 10 mCi having gamma radiation with 356 keV energy for one day at room temperature. It was observed that both the reverse and forward bias currents were significantly decreased after irradiation. The values of the ideality factor (n), the barrier height (Φ_b) and the reverse saturation current (I_0) from forward bias I-V characteristics of the device for before and after irradiation were obtained by using thermionic emission theory. The reverse saturation current (I_0) decreases from 21.8 nA to 13.9 nA after irradiation process. The barrier height of the Al/methyl violet/p-Si SBD increases from 0.79 eV to 0.84 eV after irradiation. The increase in the value of the barrier height after irradiation may be explained by reduction in carrier concentration in the depletion region of Al/methyl violet/p-Si Schottky diode through the occurrence of traps and recombination centers associated with the radiation damage[1]. It has been seen that ideality factor of the device increases 2.19 to 5.73 after the irradiation. According to Jayavel [3], the ideality factor increases due to the inhomogeneity of the interface that depends upon gamma irradiation-induced damage. Additionally, the increase of ideality factor indicates an increase of defect density at the interface after the gamma-irradiation [10]. The results indicated that gamma irradiation induced an increase in the Schottky barrier height and ideality factor. We have also observed that the reverse bias current of the Al/methyl violet/p-Si contact significantly decreased after irradiation. The basic results as related to the gamma irradiation have indicated that this device may have applications as radiation sensors in order to detect the gamma radiation.

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Temperature Dependent Electrical Characterization Of A Metal/Semiconductor Contact With An Organic Dye İnterlayer

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A metal-semiconductor contact with an organic dye was formed by spin coating of Brilliant Green dye on p-Si semiconductor and evaporating Al on organic dye film. It was seen that the contact has excellent rectification behaviour and obeyed thermionic emission theory. The electrical parameters of the diode including ideality factor, barrier height, series resistance and interface state density were extracted using its current-voltage (I - V) measurements between 300 and 380 K. Electrical properties of the device obtained from C - V characteristics were compared with the ones obtained from its I - V characteristics for room temperature. It was seen that at sufficiently high frequencies, the charge at the interface cannot follow an ac signal.

Electrochromic Behaviour Of W_3 And Mo_3 Mixed Structures

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Transition metal oxides offer a wide range of electronic properties in the advanced technological applications such as electrochemistry, microelectronics, optics and magnetism. Among the transition metal oxides, molybdenum trioxide (MoO_3) and Tungsten Trioxide (WO_3) sensors in thin film forms have wide range of applications i.e. photocatalysis, electrochromic, field-emission, and solar energy devices due to their optical and electrical properties. Molybdenum trioxide, compared to Tungsten Trioxide, shows lower color efficiency. However the closer position of its optical absorption peak to the human eye sensitivity peak makes this material very attractive as electrochromic material. Mixed films based on W and Mo oxides are expected to exhibit an enlarged optical absorption band. Mixed oxides, based on tungsten with molybdenum trioxides system are studied with aim to improve the electrochromic properties. W-Mo oxide thin films were deposited using the spin coating technique from solutions of Mo and W powder dissolved in Hydrogen peroxide and deionized water. The samples were grown on ITO glass substrates and they were annealed different temperatures. In the experiment, Structural, surface, optical and electrochromic properties of deposited and annealed films were observed and characterized.

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The Interface States and Series Resistance Effects On Current-Voltage (I-V) Characteristics of Au/P3HT/N-Si Schottky Barrier Diodes (SBDs) At Room Temperature

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The I-V characteristics of Au/P3HT(poly3-hexylthiophene)/n-Si schottky barrier diodes have been investigated in the frequency range of 10 kHz - 1 MHz at room temperature. The electrical parameters such as ideality factor (n), zero-bias-barrier height (Φ_{B0}), series resistance (R_s), depletion layer width (W_D) and doping concentration (N_D) of Au/P3HT(poly3-hexylthiophene)/n-Si schottky barrier diodes have been investigated by using the forward and reverse bias current-voltage (I-V), capacitance-voltage (C-V) and conductance -voltage (G/ω -V) measurements at room temperature. In addition, the density of interface states (N_{ss}) distribution profiles as a function of (E_c - E_{ss}) was extracted from the forward I-V measurements by taking into account the bias dependence of the effective barrier heights and series resistance (R_s).

The Comparison of Electrochromic Properties of Structures NiO And WO₃

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Electrochromic (EC) materials can change their colour in the presence of an electric voltage. This electric potential difference makes them suitable for many applications such as smart windows, mirrors, optical filters, displays and data computer storages. Among anodically colouring electrochromic materials, nickel oxide is considered to be a good anodic candidate because it has low material cost and an excellent electrochromic properties. Usually, nickel oxide is used as a counter-electrode in complementary EC devices assembled with a cathodic EC electrode, such as tungsten oxide. Tungsten oxide also finds potential application in the areas of electrochromic material which is good cathodic candidate. In this study the films were prepared using a sol-gel spin-dip coating and spray pyrolysis methods with Nickel Acetate-Nitrate with ethanol-methanol solutions and Tungsten powder with Hydrogen Peroxide- Sodium Tungstate solutions on ITO glass substrates. We aimed to observe structure, surface, optical and electrochromic properties of deposited and annealed films in this experiment. The detailed electrochromic properties of films of NiO and WO₃ were compared.

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Suitability of Inkjet Printed OTFTs For Logical Circuits

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One of the most attractive properties of organic electronics is the possibility of using mass production methods, such as printing, to produce low-cost large-area electronic circuits and devices on flexible substrates [1]. Ring oscillators are present in all the electronic circuits for enabling the time synchronization between a sequence of electronic operations [2]. In this paper, we have printed odd and even number of organic thin film transistors (OTFTs) for fabricating a flexible electronic circuit which will demonstrate logical behavior using unit inverters. Herein, the OTFTs are printed using the inkjet technology and are based on Bottom Gate Bottom Contact (BGBC) architecture [3]. Silver is used as the metal electrode for the Gate and Source-Drain contacts. A cross-linked polymer is used as the dielectric and p-type organic semiconductor as the semiconducting layer. A correlation is shown for the electrical functionality of individual OTFTs with the different channel ratios.

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Effects of Stabilizer Amount On The Properties Of Solgel Grown $\text{Cu}_2\text{ZnSnS}_4$ Films

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As a promising solar absorber, the $\text{Cu}_2\text{ZnSnS}_4$ compound has been popular recently for the production of green and economical thin-film solar cells owing to the abundancy and non-toxicity of all the constituents [1-4]. In this study, we have produced $\text{Cu}_2\text{ZnSnS}_4$ films via the sol-gel technique. As a stabilizer, the effects of the diethanolamine on the properties of the films were investigated. The amount of diethanolamine significantly affected the crystal structure, crystallite sizes and phase purity of the films. X-ray diffraction and Raman spectroscopy analyses confirmed the formation of phase-pure CZTS films. It was found that the film produced by using 2 ml of diethanolamine in sol exhibited pure CZTS phase, compact and dense morphology and enhanced photo-sensitivity. Light on/off current ratio of the n-Si/ $\text{Cu}_2\text{ZnSnS}_4$ junction was found to be 47 under 100 mW/cm^2 of illumination. Electrical activation energies of the films were investigated and the variations were attributed to delocalized phonon states generating from the presence of other phases and lattice defects.

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An Experimental Investigation Of Current Voltage Properties Of AlGaInP/GaInP Under Magnetic Field At Room Temperature

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In this work, the dark current voltage properties of a pn homojunction and AlGaInP/GaInP quantum well structure have been investigated under dc magnetic field at room temperature. Measurements have been carried out at different angles, that is the angle between magnetic field and junction current. Changing the angle and magnetic field from 0 T to 1 T with 0.1 T step, the measurements were taken at room temperature and angle dependence were not found. Besides the magnetis field dependence of the electronic properties such as current – voltage, percent change of junction current, magnetoresistance and percent change of magnetoresistance MR %, have been investigated. Using current voltage characteristics, the percent difference was obtained than the biggest change depending on the magnetic field magnitude was found 36 % under magnetic field. The percent change in junction current has been invesitgated applying constant voltage. Additionally, these effects become smaller with incresing magnetic field. The percent change of magnetoresistance (MR %) shows a huge change as ~105 near side of zero bias. Either positive or negative MR % was also found. The observed change in current voltage characteristics under magnetic field is due to the modifications of energy band profile of investigated structure caused by quantum mechanical interactions such as spin – magnetic field interaction, the magnetic field dependent singlet and triplet spin state ratio.

Metal-Thickness Dependence On The Electrical Properties of Ideal Ti/n-GaAs Schottky Contacts

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Ti/n-GaAs/In Schottky barrier diodes (SBDs) with different metal thicknesses (50 nm and 100 nm) have been prepared by DC magnetron sputtering. The ideality factors obtained from I - V data measured in room temperature are between 1.00 and 1.04. The barrier height values obtained from conventional I - V method and Norde's function are in very close agreement with each other. This agreement and ideality factors being close to unity indicate that the thermionic emission is the dominant mechanism in current flow. The series resistance values of the devices were obtained from both Norde's function and Cheung's functions. We observed that the series resistance values have increased and barrier height values have decreased with the increasing metal thickness while ideality factors remained unchanged. The barrier height values of the devices with 50 nm Schottky metal thickness were found to be 0.916 eV and 0.901 eV. The diodes with 100 nm Schottky metal thickness have barrier height values of 0.781 eV and 0.800 eV. The decrease in barrier height with increasing metal thickness is interpreted as an effect of barrier height inhomogeneities at the metal-semiconductor interface. The results show that the thickness of Ti film deposited on GaAs surface has considerable effects on the barrier height value.

Effect of Copper Amount In Starting Composition On Structure and Morphology of CZTs Thin Films Prepared By Sol-Gel Spin Coating

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Among the renewable energy sources the best alternative that can support the energy demand of modern society is solar energy. The electricity production from the sun light has been increasing rapidly in many countries as the fabrication of solar cells has increased in accordance to the demand for renewable energy sources in recent years. In the coming future thin film solar cells are expected to be a dominant technology in the solar industry [1]. Among them, Cu₂ZnSnS₄(CZTS) solar cells have gained great interest in the thin film community lately [2]. CZTS has been drawing attention because such thin films are cheap, all the elements are abundant in nature and are non-toxic. A material has a tunable direct- energy band-gap and a large optical absorption coefficient [3-7]. In addition, solution-based approaches are being developed to additionally lower the cost of physical deposition methods traditionally in use [8,9]. In this study, we have fabricated Cu₂ZnSnS₄ thin films by using sol-gel spin coating method and annealing in sulphure atmosphere at 500°C. In synthesis of this compound the Cu/(Zn+Sn) molar ratio is very crucial to get stoichiometric CZTS films. In order to investigate the effects of starting composition on the structural and morphological properties of the films, we have prepared samples with the different addition of Cu at constant amounts of Zn and Sn in starting composition, and hence varying Cu/(Zn+Sn) ratio in the range from 2 to 1.6. X-ray diffraction and Raman spectroscopy analysis confirmed the formation of the CZTS. X-ray diffraction results also showed that the amount of the secondary phases was decreased with decreasing of the Cu/(Zn+Sn) ratio. From the SEM images and the results of the EDXS composition analysis, it was found that the ideal morphology of the CZTS film was obtained when the ratio of Cu/(Zn+Sn) was 1.6. The authors acknowledge the financial support of the Slovenian Research Agency. (Program Contract No. P2-0084-0106/04) and student mobility of the European Commission's Lifelong Learning Programme (LLP).

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Investigation of Light Response Of Ag/p-Si/Ag Schottky Diode Produced In Room Conditons

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In this study, an experimental work is carried out whether Ag/p-Si/Ag Schottky diode is light sensitive. Current – Voltage characteristics is investigated under light of $4,7 * 10^{15} \frac{1}{cm^2s}$ photon flux and dark condition. Quartz halogen lamp is used as light source and photon flux is measured by using BPW-34 photodiode. As the changes under illumination and dark conditions are examined, it is observed that the reverse bias characteristics showed differences. The biggest change in current is found at -1.55 V bias. So -1.55 V dc voltage is applied to examine light response of the diode under illumination and dark. Illuminated current value differs from and is greater than dark one by 10^2 . It was found that light sensitive Ag/p-Si/Ag Schottky diode relaxed in approximately 1.5s as soon as the diode is put into dark from illumination. Finally this result show that Schottky devices are favourable as light sensitive device in response time case and this study is compatible with literature [1,2,3]

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Leakage Current By Frenkel-Poole Emission On Benzotriazole And Benzothiadiazole Based Organic Devices

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In this study three organic semiconductors were used in the fabrication of ITO/PEDOT:PSS/Polymer:PCBM/LiF/Al configuration. Reverse current density-voltage (J_r -V) measurements of the samples were investigated to determine the reverse-bias leakage current mechanisms on benzotriazole and benzothiadiazole based organic devices. Our results indicate that the J_r -V plot behaviors are given by linear dependence between $\log J_r$ and $V^{1/2}$, where J_r is the reverse current density, and V is the applied voltage. This behavior is well known as the Poole-Frenkel (PF) effect. The analysis of reverse current-voltage characteristics dictates that the main process in leakage current flow is the emission of electrons from a trapped state near the metal-organic semiconductor interface into a continuum of states which associated with conductive dislocation.

Effect of Thickness On The Electrical And Optical Properties of Organic Solar Cell

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In this study, stille coupling reaction was performed using 5,8-dibromo-2,3-di(thiophen-2-yl)quinoxaline, 4,7-Dibromo-2-(2-octyldodecyl)-2H-benzo[d][1,2,3]triazole and 2,5-bis(tributylstannyl)thiophene. Triblock random copolymer poly(5-(5-(2-(2-octyldodecyl)-2H-benzo[d][1,2,3]triazol-4-yl)thiophen-2-yl)-2,3-di(thiophen-2-yl)quinoxaline) PQBT was obtained as black solid. Newly synthesized low band gap conjugated copolymer PQBT was used in organic solar cell (OSCs). The electrical and optical properties of ITO/PEDOT: PSS/Polymer: PCBM/LiF/Al OSCs with various thicknesses were investigated. The effect of different copolymer: PCBM active layer thicknesses were studied using solar simulator under AM 1.5G, 100mW/cm² white light illumination and dark current-voltage (I-V) measurement. Photovoltaic parameters such as open circuit voltage (V_{oc}), short circuit current density (J_{sc}) and fill factor (FF) from current-voltage characteristics of the solar cells and electrical parameters such as barrier height (Φ_B), ideality factor (n) were determined. Experimental results showed that the thickness of copolymer: PCBM plays an important role in organic solar cells photovoltaic performans and electrical properties.

Abstract Study The Effect Of Reactor Temperature And Precursors Positions On The Optical Band Gap Of SnO₂ Thin Films Prepared By APCVD

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In this research Tin Oxide (SnO₂) thin films were prepared from SnCl₄.5H₂O precursors by atmospheric pressure chemical vapor deposition (APCVD) method at 300, 400 and 500 °C. The precursors were put inside and outside the CVD reactor and the properties of thin films were compared. The properties of thin films were characterized by different methods such as X-ray diffraction spectroscopy (XRD), scanning electron microscopy (SEM) and UV-vis spectroscopy. The average crystalline size was obtained using Debye-Sherer equation and the optical band gap was calculated using the absorption coefficients. The results of XRD and SEM investigations showed that the films prepared by precursors inside the CVD reactor and at 500 °C, had a much better crystalline character than the situation in which the precursors were put outside the CVD reactor and at other temperatures. The optical band gap was obtained about 3.45 eV and 3.65 eV, for precursors outside and inside the CVD reactor, respectively.

Temperature Dependence of Electrical Characteristics of Ag/N-GaAs Schottky Barrier Diodes

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The electrical characteristics of Ag/n-GaAs Schottky barrier diodes have been investigated. Measurements were carried out in the temperature range of 138-300 K. The I-V analysis based on thermionic emission (TE) theory has revealed an abnormal decrease of apparent barrier height and increase of ideality factor at low temperature region. Such behavior of barrier height (ϕ_b) and ideality factor (n) is attributed to barrier height inhomogeneities prevailing at the metal-semiconductor interface. Richardson constant value obtained from Richardson plot is found to be $1.12 \times 10^{-8} \text{ A/cm}^2 \text{ K}^2$ which is much lower than the known value. The nonlinearity in the Richardson plot can be attributed to the spatial inhomogeneity in the MS interface. ϕ_{b0} versus $q/2kT$ plot was drawn to obtain evidence of a Gaussian distribution of the barrier heights, and the values of $\phi_{b0} = 0,859 \text{ eV}$ and $\sigma_{s0} = 0,105 \text{ V}$ for the mean barrier height and standard deviation at zero bias have been obtained from this plot, respectively. Moreover, the Richardson constant value obtained from modified Richardson plot, $\ln(I_0/T^2) - q^2 \sigma_0^2 / 2(kT)^2$ versus $10^3/T$ was found to be $3,20 \text{ A/cm}^2 \text{ K}^2$ which is much closer to the theoretical value than that obtained from conventional Richardson plot. Furthermore, the barrier height value of $0,828 \text{ eV}$ which is obtained from the modified Richardson plot is in quite agreement with $0,859 \text{ eV}$ value.

The Electrical Properties of Sn/InSe:Mn/In Schottky Diodes Performed On Mn:InSe Growth By Bridgman Technique

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We have deposited p-InSe with Mn by Bridgman technique. We have performed Sn/InSe:Mn/In Schottky diodes. We have made the current-voltage (*I-V*) and Capacitance-voltage (*C-V*) measurements to determine the electrical characterization of Sn/InSe:Mn/In Schottky diode. The ideality factor and barrier height values of diode have been calculated as 1,3 and 0,426 eV, respectively. Built-in potential and Fermi levels, acceptor concentration and barrier height of Sn/InSe:Mn/In Schottky diode were calculated from *C-V* measurements at the different frequencies (between 5-20 kHz) at room temperature, respectively.

Nickel Doping Effect On Some Physical Properties of Sol-Gel Spin Coated ZnO Thin Films

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Nickel (Ni) doped Zinc Oxide (ZnO) thin films with different Ni doping content were deposited by sol-gel spin coating technique. The several chemicals used as zinc acetate dehydrate [$\text{Zn}(\text{CH}_3\text{COO})_2 \cdot 2\text{H}_2\text{O}$ - as Zn precursor source], nickel(II) acetate tetrahydrate [$\text{Ni}(\text{OCOCH}_3)_2 \cdot 4\text{H}_2\text{O}$ -as Ni dopant source], 2-Methoxyethanol [$\text{C}_3\text{H}_8\text{O}_2$, 2-MTE- as solvent] and monoethanolamine [$\text{C}_2\text{H}_7\text{NO}$, MEA-as stabilizer] for preparing solutions. After the preparing of above solutions, they were stirred at 70 °C for 2 h to obtain homogenous solutions. The microscopic glasses were used as substrates. In the spin coating stage, glass substrates were rotated at a speed of 3000 rpm for 20 sec. by using a spin-coater after dropping the appropriate solution on glass substrates. The as-coated films were sintered at 200 °C for 5 min to evaporate solvent and to remove the organic sediments. They were cooled to room temperature spontaneously and this procedure was repeated for 10 times. Finally, all spin coated films were annealed in air at 400 °C for 30 minutes. Microstructural, morphological and optical properties of the films were investigated as a function of Ni doping content, which its content in solutions changed from 0 at. % to 5 at. %. The microstructure properties of Ni doped thin films were investigated with Rigaku D/Max-III C diffractometer with $\text{CuK}\alpha$ radiation ($\lambda=1.5418 \text{ \AA}$). Surface morphology and doping effects on morphological properties of films were investigated with Atomic Force Microscope (AFM). Optical transmittance of all films was investigated by UV-VIS spectrophotometer (Perkin-Elmer, Lambda 35) nm. From XRD patterns the films exhibited a hexagonal wurtzite structure. AFM and UV-VIS spectrophotometer analysis showed that surface morphology and optical properties of ZnO depended on Ni doping ratio. These results indicates that Ni doped ZnO thin films can be successfully deposited by sol-gel spin coating process.

Nanocrystalline Thin Films Of AgS Grown By Spray Pyrolysis

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Nanocrystalline thin films of AgS were grown onto clean glass substrates using the spray pyrolysis technique. The films were characterized by XRD and EDAX. To produce the nanocrystalline films of AgS, an aqueous mixture of solutions of AgCl_2 and $\text{CS}(\text{NH}_2)_2$ was converted into a fine colloidal solution by adding acetonitrile, and then sprayed on to 300 °C heated glass substrates. It was observed from the SEM images that film was homogeneously shielded on the surface of bottom material. Band gap of the film was determined from the adsorption measurement

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Characterization Antimony and Fluorine Doped Tin Oxide Thin Films With XRD, SEM and FTIR Dependent On Substrate Temperatures

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In this study, antimony and fluorine doped tin oxide ($\text{SnO}_2\text{:Sb:F/AFTO}$) thin films which prepared by using cost-effective spray pyrolysis technique were deposited on the glass substrates at different substrate temperatures. X-ray diffractometer (XRD), Scanning Electron Microscope (SEM) and Fourier Transform Infrared Spectroscopy (FTIR) studies were performed on AFTO films coated on glass substrates. It was investigated the effect of different substrate temperature on the structural, morphological and stretching vibration frequencies properties between atoms which form molecules. From X-ray results, the films are polycrystalline and oriented preferentially along (110) and (200) directions. Other observed orientations are (101), (211), (220) etc. The intensities of (110) and (200) peaks become stronger with increasing substrate temperature. The XRD patterns reveal that the preferential orientation does not change with increasing substrate temperature, but the intensity of preferential orientation is increased with increasing substrate temperature until 400 °C. From SEM analysis, these thin films have rough and homogenous and the surface of the films was affected by the substrate temperature i.e grain size are increasing with increasing substrate temperature until 400 °C. This result compatible with the results obtained from XRD results. It was determined with FTIR studies, stretching vibration frequencies of between atoms which form molecules. The main IR features of AFTO thin films at 560 and 647 cm^{-1} are ascribed to O–Sn–O and Sn–O stretching vibrations, respectively. This state is in agreement with the literature. Since crystalline increase and defect decrease with increasing substrate temperature, it was shown that Sn–O stretching is powering.

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Analysis Of Current-Voltage-Temperature (I-V-T) And Capacitance-Voltage-Temperature (C-V-T) Characteristics Of Ti/P-Si Schottky Structures

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The current-voltage (I-V) and capacitance-voltage (C-V) characteristics of Ti/p-Si/Al Schottky contacts have been studied in the temperature range 80-300 K in steps of 20 K. The ideality factor (n) and zero-bias barrier height (Φ_{b0}) value which obtained from I-V curves were found to be strongly temperature dependent. It has been shown that the ideality factor decreased and the barrier height increased with increasing temperature. Furthermore, the barrier height and carrier concentration are calculated from reverse bias C^{-2} -V measurements as a function of the temperature.

Point Defect Investigation of AlInN Hemt Structure

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With the metal-organic chemical vapor deposition (MOCVD) method, AlInN HEMT structures, were grown on sapphire substrate as AlN buffer and GaN epi-layer. Under In increase, AlInN/AlN/GaN HEMT point defect features were studied with high resolution X-Ray Diffraction (HRXRD) and structural results were compared with result parameters of Hall Impacts (HALL) and atomic force microscopy (AFM) and Fourier Transform Infrared Spectroscopy (FTIR). The increase and decrease in AlInN half-width figures is similar to GaN and AlN compliance. The strain and relaxation levels of active layer of the HRXRD results in HEMT structure, bending and biaxial, hydrostatic and mixed strain figures are monotonically affected by In rates. AFM results depend on In rates of surface morphology of the layers. While In rates are at increase, the surface morphology of the samples change from a terraced structure into island-like structure. The FTIR and PL results of active layer are compatible with HRXRD point defect properties. As a result, the point defect structures of AlN and GaN structures have the same tendency and representation of AlInN HEMT.

Effect Of Different Spin Speed On Structural And Physical Properties Of Doubly Doped Tin Oxide Thin Films Prepared By Spin Coating Method

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Among transparent conducting oxides, tin oxide family are widely used in solar cells, display devices, hybrid microelectronics, stable resistors and gas sensors etc. due to their extraordinary properties. In this study, main focus is on $\text{SnO}_2\text{:Sb:F}$ thin films. So, they were prepared on optical glass by spin coating system by the fabrication of $\text{SnCl}_2 \cdot 2\text{H}_2\text{O}$, NH_4F , SbCl_3 as precursors of Sn, F and Sb elements, respectively. Doping weight ratio of Sb and F, respectively, are 4% and 30%. Precursors were dissolved in the deionized water with help of HCl. After dissolving, that solution was stirred at 60 °C for 60 min to gain homogenous solvent. Spin speeds were varied ranging from 1000-8000 rpm in steps of 1000 rpm. Number of layers is fixed to 6. The spin cycle followed in this study was a two-step process: the first step was spinning for 10 second and at 500 rpm, the second step was spinning fastly for 20 seconds. The first step in this technique enables to paste the sols substrates before starting the high speed next step to make fluid thinner. After the deposition, coated substrates were heated in furnace at 150 °C. The glass substrates were then baked at 400 °C for 60 minutes in air to remove the solvents from the substrate. After preparation, their structural, electrical and optical properties were characterized. Finally, these films are single crystalline and orthorhombic structures with (021) preferential orientation. The films are highly transparent in the visible region (85%). High conductivity and transparency of the films suggest that these films are likely to be useful as electrical contacts in various electronic and energy harvest applications.

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Detailed Experimental Studies On Influence Of Intrinsic Material Properties On Photoresponsive Organic Field-Effect Transistors (PhotoOFETs)

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Photoresponsive organic field effect transistors (Photo - OFETs) have been widely investigated in recent years in consequence of their potential application in light-induced switches, light-triggered amplification, detection circuits, and highly sensitive image sensors. Photo - OFET is a sort of three-terminal optoelectronic device in which light can be used as an external stimulus to create photogenerated carriers in addition to the carriers induced by the gate voltage [2]. In this work, we employed poly[2-methoxy-5-(3',7'-dimethyloctyloxy)-1,4-phenylenevinylene] (MDMO-PPV) with different intrinsic properties as an organic semiconductor. Bottom contact and top gate with gold interdigitated source drain contact on glass substrates with channel lengths of 100 and 50 μm were used for these studies. Poly(methyl methacrylate) (PMMA) was used as organic dielectric layer. Under illumination, better intrinsic material properties of organic semiconductor presents better photoresponsivity. As shown figure 1, transfer and output characteristic of OFETs are strongly depends on illumination intensity. In conclusion, photo-OFETs are successfully fabricated and optimized in terms of material properties. High molecular weight and low polydispersity MDMO:PPV phototransistors exhibited excellent photoresponse properties with a maximum on/off ratio of 0.25×10^2 .

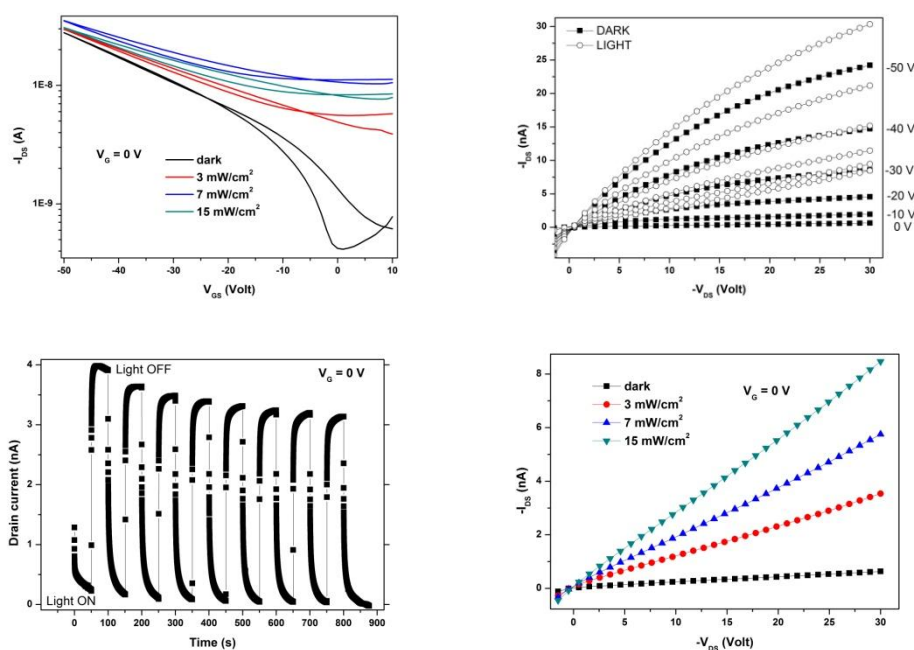


Fig.1 output and transfer characteristic properties of photo OFET.

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Simple Fabrication of Cr Functionalized ZnO Nanorods and Investigation of Electical Properties

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This work is based on functionalization of zinc oxide (ZnO) nanostructures with by using simple and low-cost fabrication techniques and investigation of electrical properties. ZnO nanostructures were produced in the shape of nanorods with hydrothermal process on glass susbtrate. Functionalization of ZnO nanorods was performed by sol-gel deposition techniques. To investigated electrical properties of metal functionalized ZnO nanorods, current-temperature measurements were performed in the range of 30C-200C. ZnO is a n-type semiconducting materials with direct and wide energy band gap. Due to the electrical, optical and non-toxic properties, ZnO have been used in transistors, light emitting diodes, solar cells, gas sensors and medicine [1]. ZnO nanorods were fabricated vertically aligned on glass substrate and the details were given in our previous work [2]. ZnO nanorods were functionalized with chrome by sol-gel deposition techniques. In sol-gel process ZnO nanorods were coated with acetate solution (0.01M) prepared in ethanol by using spin coating and then dired at 130°C for 5 min. Coating and drying process were repeated for five times and then samples were annealed in air ambient at 300C. The diameters and lengths of ZnO nanorods were approximately 100 nm and 1.62 µm, respectively. Electrical properties of functionalized ZnO nanorods, current-measurements measurements were performed in dry air ambient as a function of temperature and the temperature ranges was in the 30-200°C. And then for plotting current was plotted versus to temperatures for a constant potential (1V). current –voltage (I-V) and current temperature (I-T) graphs were given in figure 1. Current of functionalized of ZnO nanorods increased with increased of temperatures especially after 130°C and the linearity of I-V curves broke down slowly with increasing temperatures.

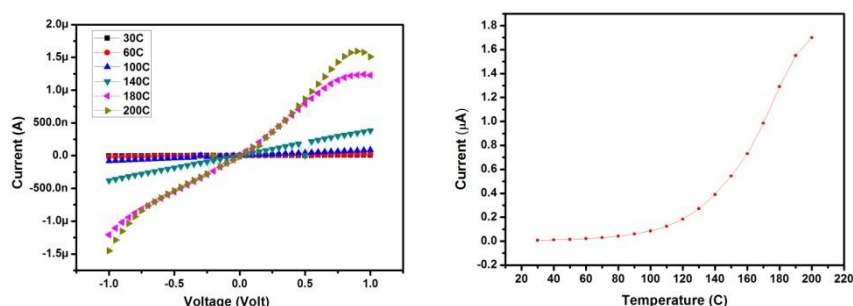


Figure 1: a)I-V and b)I-T curves of Cr functionalized of ZnO nanorods

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Illumination Impact On The Electrical Characteristics of Sputtered Au/Ti/ Al₂O₃/N-GaAs Schottky Diodes With Atomic Layer Deposited Al₂O₃ Interfacial Layer

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Utilization of Al₂O₃ as an interfacial layer by atomic layer deposition (ALD) technique provides more uniform interfaces for Schottky-barrier diodes (SBDs) or solar cell applications. Based on this idea, we prepared Au/Ti/ Al₂O₃/n-GaAs Schottky diodes as a solar cell. The thickness of the Al₂O₃ interfacial layer fabricated via ALD was ~3nm. The IV characteristics of the solar cell have been measured under the 630 W/m² light value. Open circuit voltage and short circuit current of the device is obtained as; 0,159922 and 40x10⁻⁸, respectively.

Preparation of Poly (N-Vinyl Carbazole)-Co-Poly(2-(Dimethylamino)Ethyl Methacrylate) Based Hydrogen Bonded Side-Chain Liquid Crystal Copolymer

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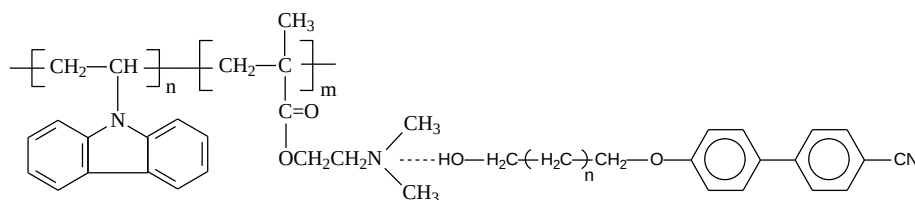
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Poly(N-vinylcarbazole) (PVK) is a photoconductive material and numerous carbazole-containing polymers have been described in literature [1]. Side chain liquid crystalline polymers (SCLCPs), which combine the unique properties of low-molar mass liquid crystals and polymers, have been the subject of intensive research mainly due to their interesting electrical and optical properties [2,3]. Self-assembled materials formed by non-covalent bonding have attracted much attention because these materials are good candidates for the next generation of materials, for which dynamic function, environmental compatibility, and low energy processing are required. In this study, a copolymer of N-vinyl carbazole and 2-(Dimethylamino) ethyl methacrylate has been prepared by radical polymerization method. The obtained copolymer has been interacted with nematic liquid crystal mesogen to obtain hydrogen bonded side-chain liquid crystal copolymer.



Scheme 1. Preparation of the side chain liquid crystal copolymer

SCLCP has been studied by broadband dielectric spectroscopy (BDS). The dielectric behavior of the LCs shows dielectric relaxation frequency mechanisms. The experimental data have been analyzed the Debye or non-Debye type properties by Cole–Cole plot of the dielectric function. Opto-electronic, thermal and spectroscopic properties of the copolymer have been investigated.

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Highly Ordered Titanium Dioxide Nanotube Arrays: Fabrication and Characterization

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Titanium dioxide (TiO₂) nanotube arrays have been used in a wide range of application areas such as photo electrochemical materials, dye-sensitized solar cells [DSSC], hydrogen (H₂) sensors, oxygen (O₂) sensors, bio-sensing and biomedical applications, and catalyst support [1, 2]. Anodic porous TiO₂ and TiO₂ nanotube arrays were first synthesized using hydrofluoric acid (HF) electrolyte by Zwilling et al. [3] and Gong et al. [4] respectively. Thereafter, many studies succeeded in controlling and extending the nanotube morphology, the length, the pore size, and the wall thickness. The choice of electrolyte plays a critical role in determining the resultant nanotube array. There have been four generations according to the electrolyte used to fabricate TiO₂ nanotube array up to now [1]. The first generation electrolyte was fluoride containing solution, the second was pH dependent solution, the third was organic polar electrolyte and the fourth was fluoride free solution. Previously we fabricated TiO₂ nanotube arrays by using first generation electrolyte with anodization of Ti foil or Ti thin film and investigated their gas sensing properties [5, 6]. In this work we fabricated TiO₂ nanotube arrays by using third generation electrolyte (0.1 – 1 wt% NH₄F in ethylene glycol solution) with anodization of Ti foil and studied structural characterization. The effect of electrolyte, anodization voltage (20-120V), anodization time (0.5 – 15 hour) and anodization temperature (0-20 °C) on the nanotube structure was also investigated. Structural and morphological characterization were performed by using X-ray diffractometers (XRD) and scanning electron microscope (SEM). It was found that the inner pore diameters of TiO₂ nanotubes increased with enhancing anodization voltages and the length of TiO₂ nanotube increased with increasing anodization time.

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Zinc Stannate/Graphene Oxide Hybrid Material and Its Photocatalytic Activity

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The use of synthetic dyes in many fields of applications such as textiles, papers, leathers, additives, food and cosmetics is continuously increasing. Due to their extensive applications, large-scale production and chemical stability, these pollutants can cause significant environmental pollution [1]. A wide range of methods such as photocatalysis have been developed and extensively studied for the removal of hazardous chemical compounds from water wastes to decrease their impact on the environment. Even though much work in heterogeneous photocatalysis has been focused on semiconductor materials such as TiO_2 , ZnO , Fe_2O_3 , WO_3 , Ta_2O_5 , ZnS and CdS , these materials often display large bandgaps, which require UV light irradiation and thus limiting the efficient utilization of solar energy [2]. Herein, we report on the preparation and photocatalytic activity of zinc stannate/graphene oxide (ZTO/GO) hybrid material. The technique used for the preparation of the ZTO/GO material relies on thermal treatment of a mixture of ZTO and GO at 80°C for a few hours. The resulting hybrid material has been characterized using UV/Vis spectrophotometry, Raman spectroscopy and FTIR spectroscopy. The photocatalytic properties of the resulting material have been evaluated for the degradation of rhodamine B under visible light irradiation (Figure 1). Our results suggest that the hybrid material displays higher photocatalytic activity than ZTO and GO taken separately. The technique reported herein can be easily generalized to other types of nanoparticles and holds promise in view of various photocatalytic applications of the resulting nanocomposite materials.

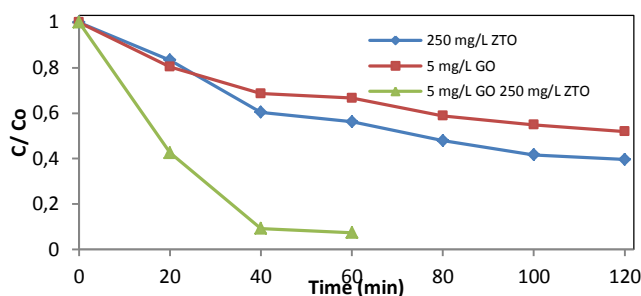


Figure 1: Photodegradation of rhodamine B under visible light irradiation.

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Corrosion Behaviour of Electrochemically Deposited ZnMn Alloys on AISI 4140 Steel

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Zn–Mn coatings were electrodeposited on AISI 4140 steel substrate from an acidic chloride bath containing a commercial additive. The morphology of the coatings was studied by SEM. The crystal structure was investigated by powder and thin-film XRD. The corrosion behaviour of Zn–Mn alloys was tested by measurement of free corrosion potentials in aerated NaCl solution. It was found that this additive permits to obtain dense, compact and thick Zn–Mn coatings. The morphology is quite particular, displaying hexagonal pyramids whatever the manganese content of the coating. It can be seen that the free corrosion potentials of all the zinc alloys more positive but a little negative than that of AISI 4140 steel substrate, which indicates that the Zn–Mn coating is an ideal anodic protective coating for steel products, and can provide longer protection for steel products.

Investigation of The Effect of Gamma And UV Radiation on The Polyaniline Coated PVC Microspheres

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In this study the examination process of the effect of gamma and UV rays on PANI coated PVC microspheres, which are prepared by chemical oxidative route in different reaction medium, is being described. The PANI coating reactions were carried out either with using different concentrations of alcohol (0,01, 0,1, 0,2 and 0,4 M) or with using different amount of PVC microspheres (between 0,1-5g). The coating thickness was observed with the changing amounts of alcohol concentration and with the amount of PVC. Depending on the alcohol concentration, the product structure was shown to have differences in shape such as spherical, 2 dimensional or 3 dimensional (0,1, 1, 20 and 40 ml alcohol respectively). When the thickness of the coating increases, the penetration depth of the UV rays decrease and the possible reactions do not take place. Because of the unpredictable event any change is not observed in the conductivity. Whereas the PANI/PVC films exposed the UV irradiation, the conductivity was increased 100 fold rather quickly. When it comes to gamma irradiation, the penetration of the gamma radiation is unlimited and thus lots of chemical reactions and radiolysis products were occurred and depend on the chemical changing conductivity of the coating PVC microspheres was increased(10-4 fold) with increasing radiation doses. Before and after irradiation, all the samples were analyzed with FTIR, UV-vis spectrometer, conductivity (four probe technique) and SEM.

Investigation Of Some Optical and Structural Parameters Of MnO and Boron Doped MnO Films Growth By Spray Pyrolysis Technique.

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MnO and boron doped MnO thin films were grown on glass substrate using a typical spray pyrolysis technique. The spraying solution was prepared by dissolving 0.1 mole of manganese chloride (MnCl_2) in double distilled de-ionised water along with 0.1, 0.2, 0.3 and 0.4 mol H_3BO_3 , respectively. The substrate temperature was maintained at 375°C ($\pm 2^\circ\text{C}$) through a thermocouple (Pt-100) as a sensor for temperature controller. Purified air was used as a carrier gas and it was maintained at constant flow rate of about 5ml/min. The nozzle to substrate distance was kept at 30 cm. The MnO and boron doped MnO films were subjected to X-ray diffraction technique, SEM, EDX using a JEOL JDX service having $\text{CuK}\alpha$ radiation ($\lambda = 1.5406 \text{ \AA}$) to investigate the structural properties. Transmittances versus wavelength measurements were made using Lambda 25 UVVIS- NIR spectrophotometer. The diffraction pattern of the samples were exhibited (111), (200), (220), (311), (222) planes having cubic structure. The UV-Vis spectrum of the samples was recorded in the range of 300-1200 nm. A typical plot of $(\alpha h\nu)^2$ Vs $(h\nu)$ is used to define the band gap energies of the samples by using the extrapolation of linear portion of the curve to $(\alpha h\nu)^2 = 0$. The band gap energies of the samples were found between 2.2 eV and 2.3 eV.

Photocatalytic Activities Ag/ZnO, Au/ZnO And Pd/ZnO Doped By Borohydride Reduction Method

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Recently, photocatalysis has increased much attention for the destruction of environmentally hazardous materials and there is a growing interest in the producing of semiconductor oxide for affecting this process in environmental applications such as air and water purification, hazardous waste remediation, hydrogen production [1]. Among various metal oxide semiconductor photocatalysts, ZnO can be used to destroy the organic pollutants in water or air because its large band gap can offer the high driving force for the reduction and oxidation processes [2]. The photocatalytic performance of ZnO can be improved by various techniques. ZnO doping with noble metals is an effective method to promote the photocatalytic performance due to the creation of dopant energy levels below the conduction band and trapping the photo-induced charge carriers, thereby improving the charge transfer processes [3,4]. In the present study, ZnO was synthesized by microwave irradiation. The Ag, Au and Pd noble metals were separately doped on ZnO nano photocatalysts by borohydride reduction method. The prepared photocatalysts were characterized by X-ray diffraction (XRD), field emission gun scanning electron microscope (FESEM) and energy dispersive spectroscopy (EDS). The photocatalytic activities of Ag/ZnO, Au/ZnO, Pd/ZnO and undoped ZnO have been studied for the degradation of congo red, and have also been compared with together. The experimental results of XRD and photocatalytic degradation are given in Fig. 1. As shown in Fig. 1(b), Pd-doped ZnO exhibits better photocatalytic activity for congo red degradation than other doped photocatalysts.

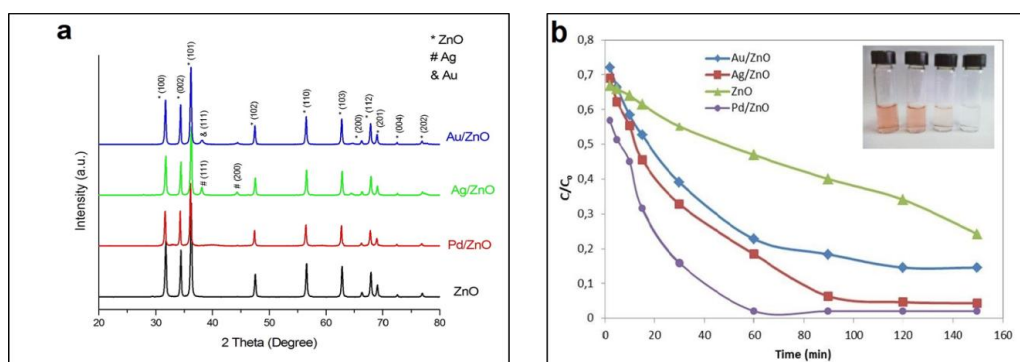


Figure 1: Characterization of ZnO, Pd/ZnO, Ag/ZnO and Au/ZnO (a) XRD patterns and (b) photocatalytic activities.

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Characterization of Indium Selenide Thin Films Prepared By Thermal Evaporation For Cu(In,Ga)Se₂/In₂Se₃/ZnO:Al Solar Cells

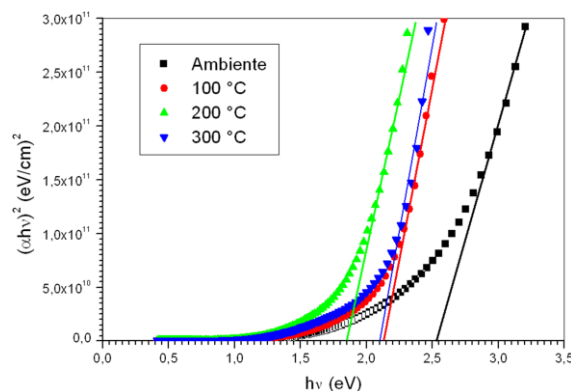
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Thin films of indium selenide (In₂Se₃) used in this work have been prepared by thermal vacuum evaporation from a single source onto soda-lime glass substrates. High purity (99.9995%) In and Se were weighed according to the stoichiometric molar ratio. Layers were obtained at various substrate temperatures (ambiente, 100 °C, 200 °C and 300 °C). The layer thickness of In₂Se₃ and evaporation rates were measured in situ by an h.f. quartz monitor and is adjusted about 260 nm for all samples. The X-ray diffraction (XRD) patterns of In₂Se₃ thin films exhibits strong (301) preferred which correspond to β-In₂Se₃ phase, but at 300 °C a change in phase (α-In₂Se₃) have observed. The morphology of the films has been observed by scanning electron microscopy (Fig.1). The surface and cross section of a film at ambient temperature provide evidence that the films are very homogeneous, have a good adherence to the substrate. The EDS results exhibit that all samples have a quasi-stoichiometry atomic composition. Electrical parameters of In₂Se₃ films deposited at different various substrate temperatures were carried out with HMS5300 Hall effect system. All samples were n type. The electron concentration of films is about 6,53.10¹⁸ cm⁻³, a resistivity of 9,73.10⁻² Ω.cm and a mobility of 9,82 cm²V⁻¹s⁻¹. The energy band gap was estimated by a plot of Tauc assuming a direct permitted transition and fitting the absorption coefficient α on a range about $(\alpha h\nu)^2 \approx 3.10^{11}$ (eV/cm)² (Fig.2). The values of band gap were between 2.10 and 2.53 eV.



Self-Consistent Analysis Of The Band Structure of Doped Lattice-Matched Ganasbi Based-Qws Operating At 1.55 μM

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Band structures of n-i and p-i doped lattice-matched GaAs/GaNAsBi quantum wells are studied theoretically using a self-consistent calculation (based on the envelop function formalism) combined with the 16-band anti-crossing model. Operating at 1.55 μm , these QWs can represent active zones of temperature insensitive optoelectronic device applications intended for optical fiber communications. We have calculated physical parameters of the structures such as the confining potential profiles, the Fermi level, the subband energies and their corresponding wavefunctions as well as the oscillator strength of inter-subband transitions, the subband occupations, and the charge density distributions. Their dependence on doping concentration and structural parameters (bismuth composition and well width) are also investigated. Finally, the absorption coefficient spectra of GaNAsBi based-QWs are also computed.

Modeling of Sub-Bande Effect in Carrier Concentration of CNTFET

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Carbon Nanotubes (CNT) has been seen as a potentially future material to provide an ultra small device by their exceptional electronic, optical, thermal, and mechanical properties, make them a promising candidate for applications in micro and nanoelectronics (essential in an application type transistor CNTFET (Carbon Nanotube Field Effect Transistor)). Each subband in CNT has a different influence on carrier transport. Therefore, the studies of subband effects are needed in order to find the enhancement of carrier transport in CNTFET. Carrier concentration is defined as the total number of carrier within the material. There are two types of carrier concentration to be measured in order to asses the subband effects which is nondegenerate and degenerate carrier concentration. Also in this paper, the band structure of the rolled-up nanotube can be obtained by zone-folding the band structure of the graphene sheet. This method is used in this work and we simulated and analyzed the band structure of carbon nanotube. We present analytical modelling of carrier concentration of a zigzag single-walled semiconducting carbon nanotube field effect transistor (CNFET) using the dispersion relation $E(k)$ (the three first sub band) of the band structure of the carbon nanotube can be obtained by zone-folding approximation. In order to show the influence of the three first sub-band energy on carrier concentration of CNTFET.

Analytical Calculation and Comparison of Numerical Solutions Obtained By The Technique of The Transfer Matrix of The Transmission and Reflection of Metamaterials

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We investigated the spectral properties of a new class of nanostructured artificial composite materials with tailored electromagnetic response, negative refractive index materials, also known as "left-handed" metamaterials. We analyzed structures incorporating both ordinary positive index media and negative refractive index metamaterials where the interface may be graded to an arbitrary degree. Utilizing a modified version of the Rosen-Morse function, we derived analytical expressions for the field intensity and spectral reflection and transmission through a graded interface between positive and negative index materials. We compared our results to numerical solutions obtained using the transfer matrix technique.

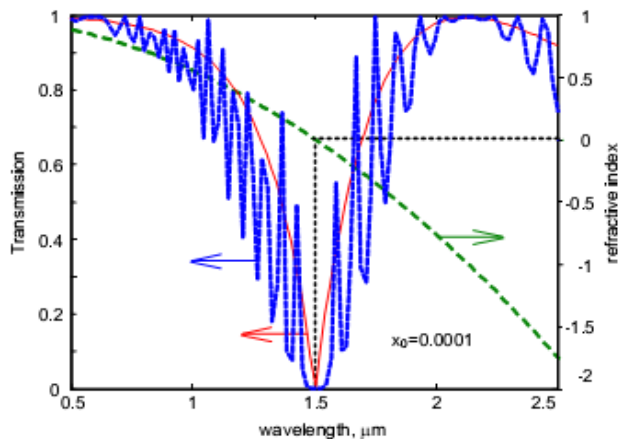


Fig. 1 Comparison of approximate analytical solution (dotted) and numerical TMM (solid) results. Dispersion of negative refractive index is also shown in the same diagram(dashed, right-hand axis)

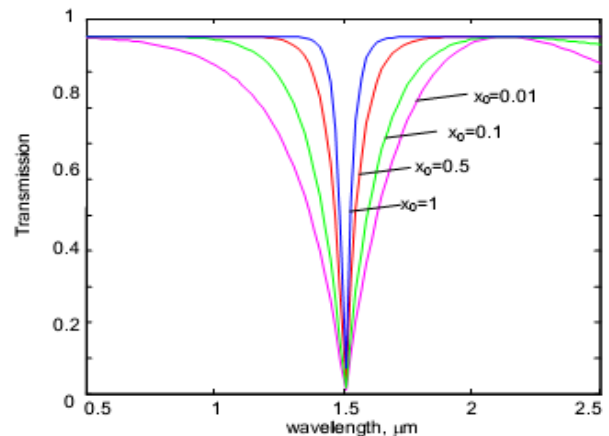


Fig. 2 Transmission of a graded positive-negative index interface for different values of x_0 .

Metalorganic Vapor Phase Epitaxy Growth Of GaAsBi/GaAs Heterostructures

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GaAsBi/GaAs heterostructures are grown at low temperature using atmospheric pressure metalorganic vapor phase epitaxy. For this study three types of heterostructures were grown: a thin GaAsBi layer deposited directly onto the GaAs substrate, a GaAsBi layer grown onto the GaAs buffer layer, and a GaAsBi layer deposited onto the GaAs buffer layer and capped with the GaAs layer. The effect of the GaAs buffer layer thickness and the cap layer growth temperature on the heterostructures photoreflectance (PR) spectra has been studied. It is shown that the PR line shape changes when one of these parameters change. The crystalline quality of the heterostructures is investigated by using high-resolution X-ray diffraction technique. The experiments showed that the crystalline quality and the optical property of the GaAsBi/GaAs heterostructures had close relation to the buffer layer thickness and the cap growth temperature.

Properties of Co-Doped ZnO Thin Films Grown By Pulsed Laser Deposition On Glass Substrates

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Undoped and Co-doped ZnO (CZO) polycrystalline thin films (Co: 3, 5 at.%) have been deposited at 450°C onto glass substrates using pulsed laser deposition method. The used source was a KrF excimer laser (248 nm, 25 ns, 2 J/cm²). X-ray diffraction patterns showed that the Co-doped ZnO films crystallize in a hexagonal wurtzite type structure with a strong (002) orientation, and the grain sizes calculated from these patterns decrease from 37 to 31 nm by increasing Co doping. The optical waveguiding properties of the films were characterized by using prism-coupling method. The distinct M-lines of the guided transverse magnetic (TM) and transverse electric (TE) modes of the ZnO films waveguide have been observed. In the aim to study the optical properties of the ZnO films, an accurate refractive index and thickness measurement apparatus was set up, which is called M-lines device. An evaluation of experimental uncertainty and calculation of the precision of the refractive index and thickness were developed on ZnO films. The optical transmittance spectra showed a good transparency in the visible region. Calculated optical band gap varying from 3.23 to 3.37 eV when the content of Co doping increases from 0 to 5 at.%.

The Characteristic Properties of Se Doped CuInGa Thin Films

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The CuInGa (CIG) thin-films were derived by a sol-gel dip coating technique. The effect of Selenium doping on CIG thin-films was examined to apply in solar cells. XRF and AFM were used to characterize the thin films. Besides, electrical properties on surface of the film were determined by using a four point probe. The variations of electrical and optical properties were investigated with the rise of selenium concentration. It was evaluated that the corporation of the level of selenium concentration improved to obtain the clear colloidal solution.

Effect of pH on The Physical Properties of CIGS Thin Films

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CIGS thin films with different pH values changing from 1 to 4 were deposited on glass substrates using sol-gel dip coating technique. The effect of pH on the structural, optical and electrical properties of the thin films was investigated. Optical properties were evaluated by using a double beam spectrophotometer. The physical properties of the thin films changed considerably with the increase of the annealing temperature. Transmittance shifted in ultraviolet range and band gap of the films changed with the increase of pH values. After all investigations, the suitable pH value was evaluated for producing CIGS [1] thin films by sol-gel deposition technique. These results indicate that films obtained transparent thin films are good candidates for applications in different optoelectronic devices.

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Antireflective ZnSnO/Ag Bilayer Source and Drain Electrodes For Transparent ZnSnO Channel-Based Thin Film Transistors

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Transparent oxide semiconductors (TOSs) have attracted great interest as next generation channel materials for transparent thin film transistors (TTFTs) and high performance and large area flat panel displays because of advantages, such as a high field effect mobility, excellent switching properties, a sputtering-based large area, low temperature deposition processing, and good process uniformity. Among the key components in TTFTs, transparent source and drain (S/D) electrodes are very important because the electrical properties and transparency of TTFTs are critically affected by the electrical and optical properties of the S/D electrodes. For these reasons, highly transparent conducting oxide materials, such as Sn-doped In_2O_3 (ITO) and Zn-doped In_2O_3 (IZO) films, have extensively been used as transparent S/D electrodes for TTFTs in academic and industrial research. Despite the high transparency of the ITO and IZO films, they are not desirable transparent S/D materials for TTFTs since they have higher resistivity than metal S/D electrodes such as Mo, Ti, and Al. Therefore, it is imperative to develop transparent S/D electrodes with a low resistivity comparable to that of metallic S/D electrodes for use in high-performance TTFTs. For this purpose, we recently reported oxide-metal-oxide (OMO) multilayer S/D electrodes for InGaZnO-based TFTs.¹ The optimized IGZO-TFT with Al-ZnO (AZO)/Ag/AZO S/D electrodes showed fairly high device performance and transparency in the visible wavelength region due to very low resistance and effective antireflection originated from the OMO structure.² However, detailed investigation of ZnSnO(ZTO)/Ag bilayer and ZTO/Ag/ZTO trilayer S/D electrodes for ZTO channel-based all-transparent TFTs has not yet been reported. In this work, we report on antireflective ZnSnO (ZTO)/Ag bilayer and ZTO/Ag/ZTO trilayer source/drain (S/D) electrodes for highly-transparent ZTO channel-based thin film transistors (TFTs).³ Although both bilayer and trilayer films have a similar sheet resistance (3~5 Ohm/square), the ZTO/Ag bilayer is a more effective transparent S/D electrode for ZTO channel layer than the ZTO/Ag/ZTO trilayer S/D electrode, due to the direct contact of the Ag layer on the ZTO channel layer and a desirable oxide-metal-oxide multilayer structure for antireflection effects. ZTO channel-based all-transparent TFTs with ZTO/Ag bilayer S/D electrodes exhibited a saturation mobility of $4.54 \text{ cm}^2/\text{Vs}$ and a switching value ($1.31 = \text{V/decade}$), comparable to those of a ZTO channel-based TFT with metallic Ag S/D electrodes. This indicates that the antireflective ZTO/Ag bilayer is a promising transparent S/D electrode for use in all-transparent TFTs as a substitute for conventional opaque metal S/D electrodes.

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The Electrical Characterization of Au/ Fe₃O₄/p-Si/Al Rectifying Contact With Fe₃O₄ Interface

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In this study a Fe₃O₄ film was coated by drip method on a p-Si semiconductor, grown in accordance with (100) orientation had a thickness of 400 µm and a resistivity of 1-10 Ω/cm and then a Au/Fe₃O₄/p-Si/Al rectifying contact was obtained by evaporating Au metal on that Fe₃O₄ film. I-V (current-voltage) and C-V (capacity-voltage) characteristics of metal/Fe₃O₄/semiconductor rectifying contact, which was fabricated by using Fe₃O₄ nanoparticles, were examined. The characterization of Fe₃O₄ nanoparticles, that were coated on the Si surface, was done by means of the TEM images and the XRD measurements. From its I-V characteristics in laboratory states, the ideality factor, barrier height (Φ_b) and the series resistance values of the Au/Fe₃O₄/p-Si/Al rectifying contact were calculated both via the conventional thermionic emission method, and by the Cheung method. When calculated by the traditional method, the ideality factor (n) was found 2,24 and the barrier height (Φ_b) was come out 0,74 eV. On the other hand, with the Cheung method, the ideality factor (n) and the barrier height (Φ_b) were calculated as 2.24 and 0.73 eV respectively. Also by the method of thermionic emission, ideality factor (n) and the barrier height (Φ_b) of the reference diode was calculated. Of the capacitance-voltage measurements, with 1/C²-V chart, the carrier concentration, diffusion potential, the Fermi energy level and the barrier height were calculated. The ideality factor (n) must be 1,01 or 1,02 for an ideal diode. To find the ideality factor of the rectifying contact that we manufactured at high values, can be explained by the model of inhomogeneity of the barrier height. While, the discrepancy in the ideality factor and the barrier height values calculated by the Cheung method, can be attributed to the series resistance effect, that corresponds to the high current and high voltage regions. As a result, compared with the reference sample, it can be inferred that the interfacial material increases the barrier height and the capacity of the diode as well.

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Current-Voltage (I-V) Characteristics Of Sn/GaTe/p-Si/Al Rectifying Contacts

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In this study, GaTe thin films were fabricated by electrochemical growth technique on (100) oriented p-Si semiconductor, which has a resistivity of 1-10 Ω/cm and a thickness of 400 μm . By evaporating Sn metal on the deposited films, Sn/GaTe/p-Si/Al Schottky diodes were produced and their characteristics were examined by the I-V (current-voltage) measurements. From its I-V characteristics, the ideality factor, barrier height (Φ_b) and the series resistance values of the Sn/GaTe/p-Si/Al rectifying contact were calculated both via the conventional thermionic emission method, and by the Cheung method. Calculated by the traditional method, the ideality factor (n) ranged from 1.12 to 1.4, while the barrier height (Φ_b) from 0.72 eV to 0.78 eV. Ideality factor and barrier height values can provide information about the homogeneity of the rectifying contact. The ideality factor (n) must be 1,01 or 1,02 for an ideal diode. To find the diode parameters different from an ideal diode, can be attributed to the effect of many parameters such as inhomogeneity of the barrier height, the effect of the image force and the interface states. When the laboratory-state I-V characteristics of the Sn/GaTe/p-Si/Al rectifying contacts were examined by Cheung method, the ideality factor (n) ranged from 1.43 to 3.09, while the barrier height (Φ_b) from 0.64 eV to 0.73 eV. After this work, the parameters obtained from the Cheung method appeared to be different from the values that come from traditional I-V characteristics. This can be attributed to the effect of series resistance, that corresponds to the regions of high current and high voltage values.

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Modification of Cellulose Acetate Nanofibers With PVP/Ag Addition

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One dimensional (1-D) nanocomposite fibers have attracted much interest due to their enhanced electrical, electronic, optical and chemical characteristics and wide potential applications. In this work, we report on the preparation, microstructure and morphology of electrospun CA in DMF solution with PVP – capped Ag nanoparticles addition and highlight the effect of the nanoparticle capping agent on the electrospun CA morphology and properties. Silver nanoparticles (Ag NPs) were synthesized using silver nitrate as the starting precursor, ethanol as solvent and poly vinyl pyrrolidone (PVP) as capping agent. The Ag NPs were added to the cellulose acetate (CA) nanostructures after CA electrospinning. The obtained CA and Ag-CA composite were characterized by various techniques such as, Fourier Transform Infrared (FTIR) spectroscopy, Raman Spectroscopy for the investigation of cellulose acetate and Ag nanoparticles structures, especially for detecting the presence of Ag nanoparticles, Scanning electron microscopy (SEM) and Differential scanning calorimetric (DSC). It was found that Ag NPs can be effectively coated on or embedded into the electrospun CA, also the electrospun CA structure and morphology can, significantly, be modified by addition of Ag NPs that are prepared with PVP as a surfactant. The resulting films have very high porosity which can have implication for filtering and electrochemical device applications. The composite materials exhibit relatively enhanced thermal stability compared to pure cellulose acetate.

Novel Combination of Layers Buffer / Window ($\text{Zn}_{0.80}\text{V}_{0.20}\text{O}/\text{Zn}_{0.99}\text{V}_{0.01}\text{O}$) for CIGS Solar Cells

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The aim of the present contribution is to give a novel combination of layers buffer / window ($\text{Zn}_{0.80}\text{V}_{0.20}\text{O} / \text{Zn}_{0.99}\text{V}_{0.01}\text{O}$) for CIGS thin films solar cells using an alone method (rf magnetron sputtering) under moderate substrate temperatures (room temperature and 200 °C) with sputtering power of 60 W. In the first step, the $\text{Zn}_{0.80}\text{V}_{0.20}\text{O}$ thin films are proposed as a new alternative buffer layer to the cadmium sulfide usually used in CIGS solar cells. These films are elaborated using $\text{Zn}_{0.80}\text{V}_{0.20}\text{O}$ nanoparticles synthesized by sol-gel process as targets. The best physical properties of these films obtained with the optimal growth conditions of 200 °C and 60 W are specifically: the high crystal quality with the lattice parameter $c=5.42 \text{ \AA}$ and the crystallite size $G=12 \text{ nm}$, the quasi-stoichiometry of this material, a smoothness surface ($R_a=0.6 \text{ nm}$), a high transmittance about 90% in the range (UV-Vis-NIR) with band gap energy $E_g=3.74 \text{ eV}$, an adequate resistivity $\rho=10^{+3} \Omega.\text{cm}$. In the second step, we have optimized the low V contents from (0.01 to 0.05) in order to obtain a suitable TCO to the $\text{Zn}_{0.80}\text{V}_{0.20}\text{O}$ buffer layer. We found that the $\text{Zn}_{0.99}\text{V}_{0.01}\text{O}$ thin films elaborated at room temperature and sputtering power of 60 W reveal the best electrical and optical properties, a low resistivity of $10^{-3} \Omega.\text{cm}$, a high transmittance 95% in the visible range and kept near 80% in the NIR which are very adequate to the ones of $\text{Zn}_{0.80}\text{V}_{0.20}\text{O}$ buffer layers. In the same manner, the crystal properties of the films are very close to those of $\text{Zn}_{0.80}\text{V}_{0.20}\text{O}$ thin films ($c= 5.24 \text{ \AA}$, $G= 12 \text{ nm}$). The transmissions of the $\text{Zn}_{0.80}\text{V}_{0.20}\text{O}/\text{Zn}_{0.99}\text{V}_{0.01}\text{O}$ structure are about 80 to 90% in the range of (UV-Vis-NIR). In this case, we can say that all the incident radiation at the illuminated side of the solar cell would entirely transmitted to the CIGS absorber, through the OTC and the buffer layer. Based on these results, a novel heterostructure $\text{SLG}/(\text{n}+)\text{Zn}_{0.99}\text{V}_{0.01}\text{O}/(\text{n})\text{Zn}_{0.80}\text{V}_{0.20}\text{O}/(\text{p})\text{Cu}(\text{In},\text{Ga})\text{Se}_2/\text{Mo}$ can be proposed.

Effective Atomic Number Determination Of Some Amino Acids By Scattering Intensity Ratios of 0.0208 Nanometer Wavelengths Photons

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The effective atomic number is a parameter that represents the atomic number of composite materials, alloys and mixtures. These materials are consisting of a combination of two or more constituents. In this situation we need a parameter that represents all constituent of the related substances. The effective atomic number is a parameter that helps us at this point. Similar to the effective atomic number, mass attenuation coefficient is a parameter that represents the attenuation properties of target materials. Target materials are reduces intensity of primary radiation in appropriate geometrical configuration of experimental procedure. Decrease of the primary radiation is related to the atomic combination of the target materials. Obtained data for the effective atomic number and mass attenuation coefficients were used in nuclear industry, radiation biology, medical physics, and radiation dosimetry and space research programs. The present measurements show that the usability of this experimental technique to measure the effective atomic number and electron density. To obtain more definite conclusions on the effective atomic number and electron densities of amino acids using this method, more experimental data are clearly needed, particularly for different scattering angles and amino acids.

Al/Ligand(N-APTH) and Al/Cu(II)Complex Organic/Inorganic Contacts

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We have produced a Ligand(N-APTH) and Cu(II)Complex of bidentate ligand containing a ring of the pyrimidine. Optical transmission measurements of the Ligand(N-APTH) and Cu(II)Complex thin films were performed by using a UV-Visible (UV-VIS) spectrophotometer. From the optical measurements, it was seen that the materials show semiconductor behaviors giving appropriate bandgaps with the values of 3.15 eV and 2.36 eV for Ligand(N-APTH) and Cu(II)Complex, respectively[Fig. 1]. With the pre-assumption that the material may exhibit a rectifier or ohmic behavior when it is brought into an appropriate contact with a metal, an attempt to explore the rectifying and ohmic properties of Al/Ligand(N-APTH)/Cu and Al/Cu(II)Complex/Cu contacts was made. Thus, we used a Cu sheet as an ohmic back contact and Al as a front contact. As a result of current-voltage (I - V) measurements, it was discovered that the devices show excellent rectifier properties with a rectification ratio of about 10^3 for Al/Ligand(N-APTH)/Cu and 10^5 for Al/Cu(II)Complex/Cu rectifier contacts, respectively. As can be seen from Fig. 2, I - V characteristics of the devices show a rectifying behavior, i.e., while the reverse currents show a weak bias voltage, the forward current increases exponentially with the voltage. In other words, current flowing metal-molecular structure interface shows an asymmetric behavior. The values of barrier height Φ_{b0} and ideality factor n for the Al/Ligand(N-APTH) rectifier contact were calculated from the y-axis intercept and slope of the linear region of the semi-log plot of the experimental forward bias I - V data according to Eqs. (4) and (5) as 0.76 eV and 1.14, respectively (Fig. 5). Similarly, the values of Φ_{b0} and n for Al/Cu(II)Complex rectifier contact were calculated as 0.75 eV and 1.39, respectively.

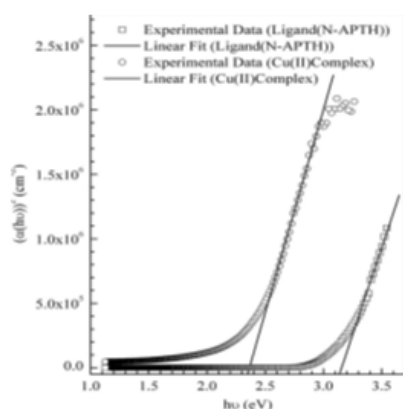


Fig. 1. The dependence of $(\alpha(h\nu))^2$ on photon energy for Ligand(N-APTH) and Cu(II)Complex.

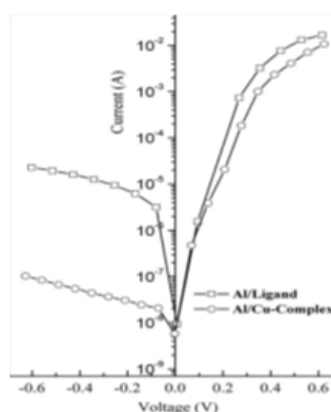


Fig. 2. Experimental forward and reverse bias current versus voltage characteristics of the Al/Ligand and Al/Cu(II)-complex contacts.

A comparative study on the electrical characteristics of Au/n-type 4H-SiC Schottky barrier diodes (SBDs) with and without TiO₂ interfacial insulator layer

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In order to improve the diode parameters, TiO₂ thin film (39 Å) was a posited on n-type 4H-SiC using Atomic Layer Deposition method. The main electrical parameters such as zero-bias barrier height ($\Phi_{B0}(I-V)$), ideality factor (n), series and shunt resistances (R_s , R_{sh}), depletion layer width (W_D), and barrier height ($\Phi_B(C-V)$) were obtained by forward and reverse bias current-voltage (I-V) and capacitance-voltage (C-V) measurements at room temperature. In addition, energy density diUstribution of interface traps (D_{it}) was obtained by taking into a count voltage dependent ideality factor (n_V) and effective barrier height (Φ_e). Experimental results show that the interfacial TiO₂ layer was improved the performance of the diode due to its high dielectric constant. A strong negative capacitance (NC) behavior has been observed in the forward bias C-V plot for the Au/n-type 4H-SiC (MS) type diode, but it disappeared in Au/TiO₂/n-type 4H-SiC (MIS) type diode. The minimum of NC corresponds to maximum value of conductance in the strong accumulation region. The measured NC values exhibit strongly voltage depended behavior. The magnitude of R_s and D_{it} can be also influenced a negative contribution.

Electrical Characterization of Ni/Al_{0.09}Ga_{0.91}N Schottky Barrier Diodes as a Function of Temperature

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The temperature-dependent electrical characteristics of Ni/Al_{0.09}Ga_{0.91}N Schottky barrier diodes (SBDs) have been investigated in the wide temperature range of 100–310K. The diode parameters such as ideality factor (n) and Schottky barrier height (Φ_{b0}) have been obtained to be strongly temperature dependent. It has been found that the ideality factor of the diode decreases and the corresponding Schottky barrier height increases with increasing temperatures. The observed variation in Φ_{b0} and n can be attributed to the spatial barrier inhomogeneities in Schottky barrier height by assuming a double Gaussian distribution (DGD) of barrier heights (BHs) at 100–170K and 170–310K. The distribution of the SBDs has shown double Gaussian distribution giving mean barrier heights of 0.889 eV and 1.368eV and standard deviations of 0.098eV and 0.157eV, respectively. As a result of the spatial barrier inhomogeneity, the value of Richardson constant has been also observed in a notable deviation from the theoretical Richardson constant of Al_{0.09}Ga_{0.91}. Then, the modified Richardson plots have been used to determine experimental Richardson constants in the two temperature regions. Also, the inverse ideality factors versus inverse temperature plot have provided bias coefficients of the mean barrier height and standard deviation of the distribution function.

First-principles investigation of Mn doped ZnS semiconductor by applying a computational method

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In recent years, semiconducting nanoclusters have drawn significant attention due to their unique optical, electrical and chemical properties originating from their small size [1]. Manganese-doped ZnS nanoparticles [2] have been extensively studied in particular for their radiative lifetime shortening and enhanced emission efficiencies. Ab initio calculations based on density functional theory (DFT) [3, 4] have become the center of attention among the researchers working in the field of computational materials science. So, these types of calculations were performed to investigate various interesting properties of this material [5, 6]. The aim of this paper therefore is to study some physical properties of $\text{Zn}_{1-x}\text{SMn}_x$.

A series of first principles calculations have been carried out to investigate structural and electronic properties of ZnSMn for three different manganese concentrations. The structural properties and electronic band structures ZnSMn were calculated using the full potential linearized augmented plane wave method (FPLAPW) [7, 8] as implemented in the Wien2k software [9]. We assessed the structural properties of $\text{Zn}_{1-x}\text{SMn}_x$ by using super cells periodically repeated. The ground state properties such as lattice constants, bulk modulus and its pressure derivative are predicted. The densities of states are also presented. The results of these calculations are compared with the available theoretical and experimental data.

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Comparison between Zinc Oxide Coatings on Glass Produced by Silar And Sol-Gel Methods

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In this study, ZnO thin films were grown on glass substrates using Successive Ionic Layer Adsorption and Reaction (SILAR) and sol-gel technique at room temperature. The structural and optical properties of the films were investigated with different analysis techniques. The X-ray diffraction (XRD) measurements showed that the films have polycrystalline structure. Energy band gap of the films were determined through optical absorption measurements. The metal contacts were made on these thin films with Ag (Silver), Fe(Iron) by Leybold Heraeus Evaporation system. The contact properties of these films were investigated by I-V measurements. The contact types were found to be ohmic.

Current-Voltage-Temperature (I-V-T) Characteristics of Au/V-doped PVC+TCNQ/p-Si structures

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The forward bias current-voltage-temperature (I-V-T) characteristics of Au/V-doped PVC+TCNQ/p-Si (MPS) type diodes have been investigated in the temperature range of 160-340 K. The apparent barrier height (Φ_{ap}) and ideality factor (n_{ap}) were found strongly temperature dependent and the value of n_{ap} decreases, while the Φ_{ap} increases with increasing temperature. Also the Φ_{ap} vs T plot shows almost a straight line which have positive temperature coefficient and it isn't agreement with the negative temperature coefficient of ideal diode or forbidden bandgap of Si ($\alpha_{Si}=4.73 \times 10^{-4}$ eV/K). The high value of n cannot explain only respect to interfacial insulator layer and interface traps (D_{it}). In order to explain such behavior of Φ_{ap} and n_{ap} with temperature, Φ_{ap} versus $q/2kT$ plot was drawn and the Φ_{ap} and standard deviation (σ_s) values found from the slope and intercept of this plot as 0.893 eV and 0.184 V, respectively. Thus, the modified $\ln(I_0/T^2) - (q\sigma_s)^2/2(kT)^2$ vs (q/kT) plot gives the mean value of $\bar{\Phi}_{bo}$ and effective Richardson constant A^* as 1.20 eV and $39.21 \text{ A} \cdot (\text{cm} \cdot \text{K})^{-2}$, respectively. This value of A^* ($=39.21 \text{ A} \cdot (\text{cm} \cdot \text{K})^{-2}$) is very close to the theoretical value of $32 \text{ A} \cdot (\text{cm} \cdot \text{K})^{-2}$ for p-Si. Therefore, the forward bias I-V-T characteristics confirmed that the current-transport mechanism (CTM) in Au/V-doped PVC+TCNQ/p-Si (MPS) SBD can be successfully explained in terms of the TE mechanism with a Gaussian distribution (GD) of BHs at around BH.

Production of PMMA via living polymerization with ATRP method

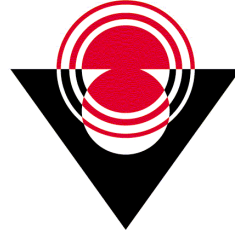
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Poly(methyl methacrylate) (PMMA) is produced by living polymerization with Atom Transfer Radical Polymerization (ATRP) method. Bu₄NBr and CuBr were added to an argon-purged tube. Methyl methacrylate (MMA) added into the tube, followed by Pentamethyldiethylenetriamine (PMDETA) injection into the mixture during continuous purge of argon to the tube. The mixture was magnetically stirred until the making the homogeneous solution. Ethyl 2-bromoisobutyrate (EbiB) was then added. The mixture have been degassed severely through glass frit with argon. External argon sources prevent the mixture to get contact with atmosphere. The tube was kept in an oil bath placed over a magnetic stirrer. The resultant polymer was a transparent solid exhibiting a light green color. The resultant polymer is poured into the silicon rubber mold under argon atmosphere inside a ATMOS bag. The resulting polymer cured under argon atmosphere. The surface micrographs of the produced ATRP generated Living Polymer PMMA are investigated for the un-broken and of the broken specimen. The hardness test results are determined for living polymer PMMA is competible with given data with the industrial literature.

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