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Ministry of Foreign Affairs: Egyptian Fund for the Commonwealth of Independent States and Newly Independent States.

Ministry of Higher Education and Scientific Research: Academy of Scientific Research and Technology.

Ministry of Military Production.

Metal Industry Co.

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1- Prof. Dr. De Graaf, Adrian
Chief of Physics and Mathematic Division, National Science Foundation (USA).

RTD1) Opportunities in Materials Research and Education

2- Prof. Dr. Habermeier, Hanns-Ulrich
Max-Planck-Institut für Festkörperforschung, Stuttgart, (Germany)
E-mail: huh@servix.mpi-stuttgart.mpg.de

OL) Materials Physics: Current Status and Future Trends.

3- Prof. Dr. Hattori, Toshiak
Institute of Applied Physics, University of Tsukuba, Tennodai, Tsukuba, Ibaraki, 305-8573 (Japan).
Email: hattori@bk.tsukuba.ac.jp
www: http://www.bk.tsukuba.ac.jp/~hattori

LW05) Optical Nonlinearity Enhancement by One-dimensional Photonic Crystal Structures

4- Prof. Dr. Karachevtseva, Lyudmyla A.
Institute of Semiconductor Physics, National Academy of Science, Kiev (Ukraine).
Email: lakar@isp.kiev.ua

LW06)Enhancement Phenomena in 2D Photonic Macroporous Silicon

5- Prof. Dr. Lashkarev, George V.
Institute for Problems of Material Science, National Academy of Sciences, Kiev (Ukraine).
Email: lashk@ipms.kiev.ua

LW04) Zinc Oxide-Analogue of GaN With New Perspective Possibilties

LW08) Phase Transformations in Narrow-gap (IV-VI) and Layered (III-VI) Semiconductors

6- Prof. Dr. Magnusson, Robert
Head Department of Electrical and Computer Engineering, University of Connecticut, Storrs, CT 06269 (USA)
E-mail: Robert.Magnusson@uconn.edu

LW01) Principles and Applications of Diffractive Optics
LW10) Waveguide-mode Resonance Effects in Periodic Films

7- Prof. Dr. Michalzik, Rainer
University of Ulm, Optoelectronics Department, Albert-Einstein-Allee 45, Ulm (Germany).
E-mail: rainer.michalzik@e-technik.uni-ulm.de
URL: http://www-opto.e-technik.uni-ulm.de/

LW03) Vertical-cavity Surface-emitting Lasers for Optical Interconnects

8- Prof. Dr. Nakayama, Takashi
Department of Physics, Chiba University, 1-33 Yayoi, Inage, Chiba (Japan).
Email: nakayama@physics.s.chiba-u.ac.jp

LW02) Characterization and Control of Surfaces and Interfaces by Reflectance Difference Spectroscopy: Recent Topics of Si Oxidation and InAs Wetting-Layer.
LW09) Optical and Conductive Properties of Kagome Flat-band Quantum-wire Systems.

9- Prof. Dr. Shabat, Mohammed M.
Department of Physics, Islamic University of Gaza, Gaza, P.O. Box 108 (Palestine).
E-mail: shabat@mail.iugaza.edu

LW07) Sensing Characteristics of Optical Nonlinear Waveguide Sensors

10- Prof. Dr. Soboyejo, Wolé
Aerospace and Mechanical Engneering Department, Pronciton Materials Institute, Princiton University (USA).

LC03) Micro Electro Mechanical Systems (MEMS) and Nanotechnology

11- Prof. Dr. Zakhariev, Boris
Lab.Theoritcal Physics, Joint Institute for Nuclear Research, Dubna (Russia).
E-mail: zakharev@thsun1.jinr.ru
http://thsun1.jinr.ru/~zakharev/

LC01) To the Theory of Waves in Periodic Structures in SUSY QM and Inverse Problem Approach (The Possibility of Qualitative Solution of Schroedinger Spectral Problem 'in mind')

12) Prof. Dr. Zhang, Pengxiang X.
Institute of Advanced Materials for Photoelectronics, KUST, Yunnan, 650051 (China)
(Max Planck Institute for Solid State Research, Stuttgat, Germany)
E- mail: pxzhang@iampe.com

LC02) New Thermoelectric Materials and New Applications

Time Table

<table>
<tr><td></td><td>09:00</td><td></td><td>10:00</td><td></td><td>11:00</td><td>11:30</td><td></td><td>12:30</td><td>13:00</td><td>13:30</td><td>14:00</td><td></td><td>15.00</td><td>15.30</td><td></td><td>16:30</td><td></td><td>17:30</td><td>18:00</td><td>18:30</td><td></td><td>19:30</td><td></td></tr>
<tr><td>Sunday
Feb. 22</td><td colspan="11">Departure:7:00 Tahrir Sq. Rest Stop
7:45 Nasr City (Lunch)</td><td colspan="2">Registration + Accommodation</td><td colspan="2">Reception</td><td>Opening Ceremony</td><td colspan="2">OL (Hab)</td><td rowspan="4">D
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<tr><td>Monday
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k</td><td colspan="3" rowspan="2">A1 + B1</td></tr>
<tr><td>Tuesday
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<tr><td>Thursday
Feb. 26</td><td>LW09 (Nky)</td><td>LW10 (Mgn)</td><td>a
k</td><td>LC3 (Sby)</td><td>Closing Ceremony</td><td>Check out</td><td colspan="3">c
h</td><td colspan="7">Departure to Cairo</td></tr>
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Breakfast will be served from 7:00 – 8:30
Posters are presented from 13:30 – 19:30 on Monday (P1) and Tuesday (P2).
The U.S.-Africa Materials Implantation Meeting-III (will be announced).

Opening Lecture

OL

Materials Physics: Current Status and Future Trends

Hanns-Ulrich Habermeier

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E-mail: huh@servix.mpi-stuttgart.mpg.de

Condensed matter and materials physics play a central role in many of the scientific and technological advances that have changed our lives so dramatically in the past 50 years. The invention of the transistor, the integrated circuit, the laser, low-loss optical fibres are the building blocks for the modern computer and communication industries. In this overview the challenges for material physics in the fields of electronic, optical and magnetic materials will be addressed and the trends given by novel quantum phenomena will be outlined. Furthermore, some trends set by modern tools for research will be covered and a concept for redefining roles and relationships of universities, government laboratories and the industry will be developed. Finally, a research strategy for condensed matter and materials physics will be given with special emphasis for developing countries.

Conference Lectures

LC1

To the Theory of Waves in Periodic Structures in SUSY QM and Inverse Oroblem Approach (The Possibility of Qualitative Solution of Schroedinger Spectral Problem 'in mind')

B.N. Zakhariev and N.M. Chabanov

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We show that the mechanism of spectral gap formation inside the continuum has a resonance nature on the whole lacuna interval. To find it becomes possible thanks to special real fundamental solutions which have knots `paradoxically' spaced with the same period equal to that of potential at all energies pertaining to the lacuna interval. Every initial free wave bump is asymmetrically transformed by the corresponding period of the potential. That eventually results in exponential increase (decrease) in the wave amplitudes in the forbidden zones. The key importance of that new insight manifests itself in that analogous alternating (from both sides) potential hits are responsible for the wave beatings in allowed zones. The inversion technique gives raise to zone control algorithms–shifting chosen boundaries of spectral bands, changing degree of zone forbiddenness (a new lever of spectral control). All this cannot be achieved by the previous Bloch wave theory (see quant-ph/0302195).

LC2

New Thermoelectric Materials and New Applications

***P.X. Zhang*[1,2], *C.T. Lin* [2,1] *and H.U. Habermeier*[2]**

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2, Max Planck Institute for Solid State Research, Heisenbergstr. 1 D-70569 Stuttgat, Germany

Thermoelectricity in general is of strong scientific and technological interest due to its application possibilities ranging from clean energy to photon sensing devices. Recent developments in theoretical studies on the thermoelectric effects, as well as the newly discovered thermoelectric materials provide new opportunities for further applications. One type of these materials is based on the strongly correlated electron systems; typical examples are the transition metal oxides, which were not regarded as very promising for thermoelectric applications. In this paper, we discuss some recent progress in this field, and special emphasize is on the new application of thin films grown on vicinal cut substrates. The thermoelectric effect is due to happen with anisotropic Seebeck components in crystals. Upon radiation of heat on the film surface, there will be an induced voltage, hence a device which can detect the heat and/or light radiation can be made. We'll show that this type of detector demonstrates novel properties, broad optical response, very fast time response and at the same time it does not need any bias, therefore it is extremely energy saving. The performance of three typical compounds $YBa_2Cu_3O_7$, $LaCaMnO_3$ and $LaSrCoO_3$ are presented.

LC03

Emergency U.S/Africa Collaborations in MEMS and Nanotechnology

Wolé Soboyejo

Princeton Institute of Science and
Department of Mechanical and Aerospace Engineering
Princeton University

This paper presents an overview of emerging U.S/Africa collaborations in micro-electro-mechanical systems (MEMS) and nanotechnology. Following a brief review of the activities of the U.S./Afnca Materials institute, the highlights of ongoing research efforts are presented, along the rationale for African research in MEMS and nanotechnology. In the area of metallic MEMS structures integrated efforts to develop reliable accelerometers and micro-switches are described along with ongoing materials contacts/plasticity, fracture and fatigue at the micron scale. In the case of bioMEMS structures, the paper describes ongoing efforts to develop engineering surfaces for impiantable drug systems arid pressure sensors. These include the use of micro-texture and nanô-scale surface coatings. These coating are shown to tncrease the adhesion between the bioMEMS structures and biological cells. in the area of nano-technology, novel nano-tabrication methods are described along with potential opportunities in nano The novel nano-fabrication methods include cold welding of organic electronic light emitting devices, and the production of functional nanostructures via focused ion beam interactions with well controlled surfaces. Finally the paper exam inos the potential use of LHRH coated magnetic nanoparticies in the specific detection of breast and prostate cancer. The implications of the work are described for science based approaches to African development.

Workshop Lectures

Chairman: Hassan Talaat

LW01

Principles and Applications of Diffractive Optics

R. Magnusson

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This workshop addresses analysis, applications, and fabrication technology of diffractive optical elements. The principal methods of modeling light propagation in periodic layers are introduced. Patterning methods such as interference lithography and electron-beam lithography are presented along with main processing techniques. Numerous applications realized with diffractive elements are presented. These include antireflection surfaces, diffractive lenses, optical interconnects, photonic crystals, polarization components, memory readout concepts, as well as optical filters, lasers, and biosensors based on resonant waveguide gratings. Examples of actual fabricated devices and their measured characteristics are emphasized.

LW02

Optical and Conductive Properties of Kagome Flat-band Quantum-wire Systems

Takashi Nakayama

Department of Physics, Chiba University, Yayoi, Inage, Chiba, Japan
Email: nakayama@physics.s.chiba-u.ac.jp

Recent topics on excitonic and conductive properties of artificial semiconductor quantum-wire lattice-network systems are reviewed, focusing on the Kagome flat-band lattice. It is shown that the exciton binding energy is extremely large compared to those of other two-dimensional systems and even that of the one-dimensional system, contrary to the well known results in the textbook, and is controllable by applying a magnetic field. On the other hand, the flat-band system has constant conductance not depending on the lattice size. These exotic properties originate from the macroscopic degeneracy of the electronic states and suggest the high potential of the artificial lattice systems to realize the exciton and conductance design.

LW03

Vertical-cavity Surface-emitting Lasers for Optical Interconnects

Rainer Michalzik

University of Ulm, Optoelectronics Department, Ulm, Germany
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In recent years, vertical-cavity surface-emitting lasers (VCSELs) have emerged as key optoelectronic devices for optical datacom, providing efficient and inexpensive short-distance interconnection of computer equipment within premises and local area network environments. In future, VCSELs will be widely applied in various fields like optical telecommunication over single-mode fibers, spectroscopy and sensing, as well as laser printing and solid-state laser pumping. This talk will be concerned with current research toward high-performance VCSELs in the InAlGaAs/GaAs material system for free-space or very short reach waveguide-based optical data communication. The latter applications include space-parallel multimode fiber links and optical backplane waveguide busses. After some overview over the field, in particular we will report on two-dimensional VCSEL arrays and polarization-controlled lasers. We have fabricated individually addressable 8x8 element 850 nm wavelength bottom-emitting arrays suited for flip-chip bonding onto electronic driver circuits. The device layout has been optimized for low internal heating and 10 Gbit/s operation has been demonstrated. Dielectric surface gratings have been successfully applied for the first time to achieve linearly polarized laser emission of transverse multimode xide-onfined VCSELs. Latest experimental results and design issues will be discussed.

LW04

Zink Oxide-Analogue of GaN With New Perspective Possibilities

***G. Lashkarev*[1*], *V. Karpina*[1], *V. Lazorenko*[1],**
***V. Khranovsky*[1], *I. Blonsky*[2] *and V. Kadan*[2]**

[1]*Institute for Problems of Material Science, National Academy of Sciences, Kiev, Ukraine.*
[2]*Institute of Physics, National Academy of Science, Kiev, Ukraine*
**E-mail: gvl35@ipms.kiev.ua*

Zinc oxide due to specific electrical, optical and acoustic properties is the important semiconductor material, which has many various applications. ZnO is a high-temperature wide band gap semiconductor (band gap Eg = 3.37 eB). Its properties are very close to those of widely recognized semiconductor for optical devices of a blue and ultraviolet range GaN (Eg = 3.39 eB). It indicates that ZnO may be used for optical devices of UV interval of wavelengths. The comparative characteristics of ZnO and GaN are discussed. Reactive thermal evaporation and RF magnetron sputtering were used for deposition ZnO films. PEMOCVD technology was also applied to deposit piezoelectric and highly transparent electroconductive ZnO films. XRD analysis and AFM study were carried out for characterization of crystal lattice perfectness and surface morphology respectively. All deposited films were polycrystalline with lattice parameter close to references data. The typical grain size was 40-60 nm. Films deposited by RF magnetron sputtering were dielectric ones with absorption coefficient up to $2x10^5 cm^{-1}$. UV photoluminescence was investigated at optical pumping by nitrogen laser. The results are discussed.

LW05

Optical Nonlinearity Enhancement by One-dimensional Photonic Crystal Structures

Toshiak Hattori

Institute of Applied Physics, University of Tsukuba, Tennodai, Tsukuba, Ibaraki, Japan
E-mail: hattori@bk.tsukuba.ac.jp
www: http://www.bk.tsukuba.ac.jp/~hattori/

We studied enhancement of optical nonlinearity of materials placed in the defect of one-dimensional (1-D) photonic crystal (PhC) structures theoretically and experimentally. To defect states in 1-D PhCs, complete coupling of incident light can be achieved, which leads to enhancement in light-matter coupling. Theoretically, we constructed a model based on a multilayer structure, and obtained expressions for the enhancement factor of the effective nonlinearity for a fixed transmittance of the device. The time response of the same structure was also discussed. Using realistic values of parameters, we predicted about two orders of magnitude enhancement in effective nonlinear susceptibility. Experimentally, we observed nonlinearity enhancement in several types of nonlinear optical materials, such as dye-doped polymers, semiconductor quantum dots (QDs) in glass, and metal QDs in polymer, using absorption saturation, pump-probe, and four-wave mixing measurements. Ultrafast nonlinear response measurements and phase-conjugated image generation were also performed.

LW06

Sensing Characteristics of Optical Nonlinear Waveguide Sensors

M.M Abadla [1] ***and M.M. Shabat*** [2*]

[1]*Physics Department, Al-Aqsa University, Gaza, Gaza Strip, Palestinian Authority.*
[2]*Physics Department, Islamic University, Gaza, Gaza Strip, Palestinian Authority.*
**E-mail: shabat@mail.iugaza.edu*

Recent years have shown increased interest in the investigation of integrated optical sensors (1-4) due to their miniature, high sensitivity, small size, immunity to electromagnetic interference and low price. Biochemical and biomedical sensors are examples of using planar integrated optical wave guides in their structures in both homogenous and surface sensing. In the past few years, there was (5-7) a significant amount of work regarding the applications of lasers and nonlinear optical materials in a large number of opto-electronics devices. The changes of the refractive index in nonlinear media may be used to control the sensitivity of nonlinear wave guide sensors. Abadla, Shabat, and D.Jäger (8,9) have shifted the study of linear wave guide sensors to nonlinear wave guides sensors. This paper presents our recent works on nonlinear wave guide sensors. Novel nonlinear wave guide sensors are designed for the first time. We derive an extensive theoretical analysis of nonlinear wave guide sensors and the conditions for the maximum achievable sensitivity. In homogeneous sensing, the wave guide sensor structure consists of a dielectric film sandwiched between a linear substrate and a nonlinear cladding. An extra very thin layer is added above the film in surface sensing. In both cases, the nonlinear cladding is considered to have an intensity dependent refractive index. Computer programs based on the derived mathematical modeling are developed to analyze the propagation characteristics of various integrated optical nonlinear wave guide structures. The theoretical requirements for reaching high sensitivity of the proposed nonlinear waveguide sensor are determined. A

comparison between linear and nonlinear sensor structures has been made. Some suggestions for optimizing the structure of the nonlinear wave guide sensors will also be derived.

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LW07

Enhancement Phenomena in 2D Photonic Macroporous Silicon

Lyudmyla A. Karachevtseva* *and V. Lashkarev*

Institute of Semiconductor Physics of NAS of Ukraine, Kiev, Ukraine
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Effects of increase in absorption of electromagnetic radiation, enhancement of photoconductivity, Raman scattering in 2D photonic macroporous silicon are investigated. Primary absorption of p-component of electromagnetic radiation, prevalence of absorption over reflection of light, angular dependences of photoconductivity, as well as enhancement of the photoconductivity in comparison with monocrystalline silicon testify to formation of surface waves in illuminated macroporous silicon structures. Its effects result in amplification of a local electric field on a surface of macroporous silicon structure and a macropore surface. The absolute maximum of photoconductivity is measured at distance between pores, corresponding by the maximal transfer electric components from a macropore surface in a silicon matrix. Conformity of spectra of photoconductivity of macroporous silicon structures to spectra of intrinsic photoconductivity of monocrystalline silicon testifies to enrichment of a surface of macroporous silicon structures by photocarriers and formation a surface waves of plasmon type. The measured value of the built-in electric field on a macropore surface achieves 10^6V/cm, the effective absorption coefficient increases 10^3 times, the signal of photoconductivity amplifies 10^2 times, and Raman scattering - up to one order of value.

LW08

Phase Transformations in Narrow-gap (IV-VI) and Layered (III-VI) Semiconductors

G. Lashkarev, M. Radchenko, A.I. Dmitriev, Z.D. Kovalyuk and E.I. Slynko*

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**E-mail: gvl35@ipms.kiev.ua*

Phase transformations are of great interest for scientific researches and applications. These phenomena were explored for two important classes of semiconductors, which belong to materials of detectors for wide range of wavelengths between visible light and submillimeters. Theoretical basis and experimental researches of ferromagnetic and ferroelectric phase transitions in IV-VI semiconductors are stated. The exclusive role of manganese in promoting of ferromagnetic interaction is shown. The observed magnetic phenomena include the appearance of the exchange thermoelectric power (TP), the additional TP, promoted by electron scattering on magnetic centers, ferromagnetic ordering at high hole concentration, the appearance of anomalous Hall effect and negative resistivity. The researches of ferroelectric's structural transitions (ST) due to electron-phonon interband interaction and ordering of the dipoles obliged to noncentral ions are outlined. The effects of ST on magnetic susceptibility (MS) and TP are described. The first observations of paramagnetic splashes of MS at ST, breaks or bends on TP temperature dependences, the existence of hysteresis phenomena, the influence of the degeneration of electron gas on TP are described. The ideas concerning the applications of diluted magnetic semiconductors in magnetoelectronic devices are outlined. The properties of layered III-VI semiconductors are considered. The evidences of two-dimensional character of electron gas in InSe are outlined. It is shown that the phenomena due to two-dimensional electronic structure are strongly expressed. At very weak current and low temperatures electrical resistivity depends on time, has specific

breaks, displays hysteresis loops in static and dynamic regimes, features of neutron diffraction due to phase transition, reconstruction of electron and phonon spectra. A small band gap ~ 10 meV dependent on electrical current appears at low temperatures. It testifies to phase transition of Pierles type.

LW09

Characterization and Control of Surfaces and Interfaces by Reflectance Difference Spectroscopy: Recent Topics of Si Oxidation and InAs Wetting-Layer

Takashi Nakayama

Department of Physics, Chiba University,Yayoi, Inage, Chiba, Japan
Email: nakayama@physics.s.chiba-u.ac.jp

Recent topics on the Reflectance Difference Spectroscopy (RDS) to control and characterize the Si-surface oxidation and the InAs wetting-layer formation are reviewed. It is shown that by measuring the RD-spectrum oscillation one can control the layer thickness of layer-by-layer Si-surface oxidation in an atomic scale. Moreover, by analyzing the RD spectra, the atomic structure and component at the SiO2/Si interface is characterized. On the other hand, the RD-spectrum change in the InAs growth on GaAs substrate before the quantum-dot formation enables us to clarify not only a variety of surface atomic structures of InAs wetting layers, such as (1← $B!_← (B3), (2← $B!_← (B3), and (2← $B!_← (B4), but also the cation-alloying dynamic process in InAs wetting layers.

LW10

Waveguide-mode Resonance Effects in Periodic Films

Robert Magnusson

Department of Electrical & Computer Engineering, University of Connecticut, Storrs, CT 06269, USA
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The principles, design, fabrication, and possible applications of periodic waveguides are presented. Computed leaky-mode field patterns are provided to illustrate their structure and the high local field enhancement obtainable. A fabricated bandstop filter is found to exhibit 90% efficiency, 1 nm linewidth, and low sidebands. Computed spectra for a single-layer bandpass filter operating at 1.55 □m wavelength yield low sidebands, extending 100 nm, and an angular aperture of ~1.7^{o}. Resonant vertical-cavity surface-emitting lasers (VCSEL) are presented in which multilayer Bragg-stack mirrors are replaced with leaky-mode resonance layers. The use of guided-mode resonance mirrors provides optical power flow across and laterally along the laser active region. The round-trip gain thus increases resulting in higher laser efficiency and relaxed mirror reflectivity constraints. As the mirror achieves high reflectivity at resonance, the laser wavelength is locked at the resonance wavelength principally defined by the period. Example resonant VCSEL embodiments are shown along with their computed characteristics. Resonant biosensors exploit the high parametric sensitivity of the guided-mode resonance effect. While this sensitivity is a potential limitation in filter applications, it can be useful for sensors as illustrated by several examples.

Round Table Discussion

Commentary: Hanns-Ulrich Habermeier
Fawzy Hammad

RTD1

International Opportunities in Materials Research and Education

Adrian De Graaf

Chief of Physics and Mathematic Division, National Science Foundation, USA

RTD2

Africa Activities

(Africa Steering Committee)

The U.S. - Africa Materials Implantation Meeting – III

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1. **Prof. Fawzy Hammad,** Chairman (Egypt)
2. **Prof. Kamal Abd El-Hady** (Egypt)
3. **Prof. Olusegun Adewoye** (Nigeria)
4. **Prof. Aboubaker Beye** (Senegal)
5. **Dr. Yadon Kohi** (Tanzania)
6. **Prof. Shorif Marouana** (Algeria)
7. **Dr. Lebusa Monyooe** (Suth Africa)
8. **Prof. Houria Rebbeh** (Algeria)
9. **Prof. Hassan Talaat** (Egypt)

Session A1

Monday, February, 22, 2004
(18:00-19:30)

Chairmen

Prof. Dr.: H. Afify
Prof. Dr.: A. El-Falaky

$A1_1$

The Electrical Characteristics of the Au- $Bi_4Ti_3O_{12}$ –Au System

A.A. Agasiev, I.M. Afandiyeva, M.Z. Mamedov

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The interest to devices on the base of thin films has increased for last decade. The achievement of thin-film technology results in development and manufacture of complex devices on the base of the semiconductor and ferroelectric materials. $Bi_4Ti_3O_{12}$ is a ferroelectric with a high temperature of the phase transition and interesting optical, piezoelectric and electrooptical properties. The research of thin films of this material will open new opportunities and will expand area of its practical application. In the present paper the structure Au- $Bi_4Ti_3O_{12}$-Au has been investigated. The system contains a thin polycrystalline film $Bi_4Ti_3O_{12}$. The film has been obtained by a magnetron sputtering method. As electrodes the gold has been used. We developed a technique of the reception of the thin films $Bi_4Ti_3O_{12}$. The current-voltage characteristic at the constant voltage, the voltage - capacity characteristics, dependence the resistance and conductivity on the voltage (at 5-200 kHz), the tangent of dielectrical losses (at $1\text{-}10^4$ kHz) have been obtained. All measurements were carried out at room temperature. Based on the obtained current-voltage characteristic the exponential dependence of current on the voltage at 0.7 -0.9 V is revealed. The nonideality factor (n=1.5), height of a potential barrier(φ =0.53eV) and the series resistance have been determined. The strong dependence of capacity and conductivity on the applied voltage corresponds meets to frequency of 5kHz.

$A1_2$

Study of Electrical and Optical Properties of $Cd_{1-X}Zn_XS$ Thin Films

M. A. Redwan, L.I. SoIiman E. H. Aly, A. A. El-Shazely and H. A. Zayed

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Thin films of $Cd_{0.9}$ $Zn_{0.1}S$ and CdS were prepared by thermal evaporation under vacuum of 10^{-6} Ton and with deposition rate about 60 rnu'rnin. X ray diffraction studies confirm the hexagonal stnicture of both CdS and $Cd_{0.9}$ $Zn_{0.1}S$ films. The effect of heat treatment with or without $CdCl_2$ enhances the grain size growth and improves the crystalline of the filii:,, Moreover, the activation energy decreases upon he treatment with or without CdC1 for all thin films. The optical absorption coefficient of $Cd_{0.9}$ $Zn_{0.1}S$ thin films were determined from measured transmittance and reflectance in the wavelength range of 300 to 2500 nrn. The optical absorption spectra reveal the existence of direct energy gap for these films. It was found that the optical energy gap decreases upon aimealing or $CdCl_2$ treatments.

$A2_3$

Investigation of D.C. Conductivity of Polypyrole Prepard by Using two Different Oxidizing Agents

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Polypyrrole (PPy)was synthesized chemically by using two different agents: ferric chloride and potassium persulfate. The synthesized samples of polypyrrole (PPy) were prepped in two forms ; film-shaped samples whose thickness were calculated by using a quartz crystal microbalance technique and disc-shaped samples pressed at 5000Kg/cm^2. The prepared samples were investigated by IR spectroscopy which showed that the molecular structure of Ppy contains C-H, C-N, C=C and N-H bonds. The effect of some different parameters on D. C. conductivity such as aging of the film, film thickness and concentrations of the reactants was investigated. Then comparison between the D. C. conductivity of both film and disc-shaped samples was presented. The results showed an increase in conductivity with increasing the concentration of the oxidizing agent in the case of using ferric chloride and a decrease with increasing the potassium persulfate concentration. The growth rate of PPy films and the yield of the bulk samples also were found to depend on the concentration of the reactans. Aging of the samples caused a loss of conductivity which was ascribed as due to the formation of defect structure such as cross-links.

$A1_4$

The Role of the Series Resistivity and Tunneling for the (Al-TiW+PtSi) -nSi Schottky Diodes

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The large difficulty in the definition of the parameters of the metal - semiconductor contacts creates the series resistance of the diode. The increase of its role at the large meanings of the enclosed voltage results in a deviation(rejection) of the current-voltage dependence from a direct line. The determination of the potential barriers height and size of the series resistance of the diode is possible by the using the Norde function. However, the series resistance is not a unique reason of a deviation of the current-voltage characteristics from the ideal characteristics. In a case of highly doped semiconductor and low temperatures when a barrier is high and narrow the probability of the tunneling through a barrier is high. We have received the Norde function for the metal – semiconductor contact in view of tunneling. Further with the use of the Norde function we have received the expressions for the series resistance and height of the potential barrier of the diode in view of tunneling. The theoretically obtained results have been used for calculation of the (Al-TiW+PtSi)-nSi Schottky diodes parameters. For investigation of transfer mechanism in the (Al-TiW+PtSi)-nSi Schottky diodes the current voltage characteristics in the temperature range of (298-453)K and voltages of (0.1-0.5)V (forward) and (0.1-20)V (reverse) have been obtained. The diode matrix has 14 diodes with the area of $(1\text{-}14)10^{-6}cm^2$. The atoms and the vacancies diffused in the semiconductor during formation of platinum silicides can play a role of the donors. It can result in increase of the concentration of the carriers. The obtained results point out that the mechanism of thermo-field emission prevails in the temperature ranges of (298-373) K. On the base of the carried out researches, in view of tunneling the height of a potential barrier and the series resistance of the diode (Al-TiW+PtSi) –nSi have been calculated: at T=300K φ=0.81 eV, R =126 Ohm; at T=433K, φ =0.87eV, R =43 Ohm. The received results are in a good with those known from the literature.

$A1_5$

Electrical Properties of Lanthanum Oxide Doped Co_3O_4 Films Prepared by Spray Pyrolysis Technique

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The Spray pyrolysis technique is suitable for prepare continuous free pine hole thin films of the compositions Co_3O_4 LaO with LaO concentrations 5%, 10% and15%. From dc conductivity measurements the themal activation energy of conduction is found to increase as the LaO content increases. The impurity stats observed to effect on the conduction mechanism at LaO content equal to10%. There exist strong connections between the frequency response and temperature dependence of conductivity. From the dielectric modulus analysis the relaxation in the system is observed with relaxation activation energy equals to 0.64 eV. The exponent s is found to equal 1 at room temperature and decreases with increase temperature. The overlap large polaron is the ionic conduction mechanism. The mixed ionic and electronic conduction is observed in the prepared samples. Oxygen content is found to effect on conduction processes.

$A1_6$

Optical Constants of Amorphous S Films

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We have analyzed the optical properties of a-$S_{70}Ge_{30-X}Sb_X$ chalcogenide glass films (x=0,10,20 and 30 at. %.); the chalcogenide films were prepared by vacuum thermal evaporation. The optical- absorption data indicate that the absorption mechanism is non-direct transition. We found that the optical hand gap, $E_{opt.}$, decreases from 2.04 ± 0.01 to 1.62 ±0.01 eV, whereas the refractive index increases with increasing Sb content. Data are analyzed by Wemple equation, which is based on the single-oscillator model.

$A1_7$

Study the Electrical Properties of Flame Retardant Polyvinylchloride Using Positron Annihilation Lifetime Spectroscopy

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Since Brown Ferry Largest Fire Cable Plant, that occurred at noon on March 22, 1975 in Alabama, attention has been taken to use Flame retardant cable in building for fire safety requirements. Flame retardants are used in wire and cable applications to prevent the conversion of an electric spark into a fire, and subsequently to prevent the spread of fire throughout a structure along the wiring. There are many substances used as flame retardants in wire and cables. In Egypt, the Multi-Purpose Reactor (MPR) insulation and jacket cables have been constructed from a flame retardant substance, the Polyvinylchloride (PVC). In the present work, the elemental, and x-ray fluorescence analysis have been performed to determine the composition of PVC in the jacket cable sample. In addition, the conductivity (α), permittivity (ε'), and dielectric loss (ε'') as well as positron annihilation lifetime (PAL) are measured in the temperature range from room temperature up at 140^{o}C. It is found that the amount of chlorine Cl in flame retardant PVC (FRPVC) jacket cable is significantly higher by 5% than the conventional PVC jacket cable. Inverse relationships between α and free volume size and fractions (V, f) through the temperature range are obtained. However, distinct positive relationship between α and I_2 above 100°C is found. The results of PAL and electrical measurements indicate that FRPVC has good electrical insulation properties below 100°C.

$A1_8$

Transports Properties of Nickel Phthalocyanine (NiPc) Thin Films

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The electrical transport properties of thermally evaporated thin films of Nickel Phthalocyanine (NiPc) with gold electrodes have been investigated. Electrical conductivity was carried out on NiPc films in the temperature range 298-423 K. Two activation energies, $\Delta E_1 = 0.12$ eV and $\Delta E_2 = 0.76$ eV, were obtained. The thermal activation energy ΔE_1 is associated with impurity conduction and ΔE_2 is associated with an intrinsic generation process. Thermoelectric power measurements proved that NiPc films are p-type. The thermoelectric power curves also exhibited two different regions corresponding to the extrinsic and intrinsic conductions. Room temperature dc current density-voltage (J-V) measurements showed a linear ohmic dependence at low voltages, followed by a power-low dependence, of exponent 6.96, at higher voltage levels. These results confirm that gold acts as an ohmic contact to NiPc, and indicate space-charge-limited conductivity (SCLC) at higher voltages. The SCLC at higher voltages was dominated by an exponential distribution of traps with trap concentration which was estimated to be $Nt = 2.79 \times 10^{22}$ m^{-3}.

$A1_9$

Photovoltaic Properties of NiPc/p-Si (Organic/ Inorganic) Heterojunctions

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Current-voltage I-V characteristics of NiPc thin film deposited on p-Si as heterojunction have been investigated. The conventional rectifying properties were shown with rectification ratio of 1750. At low voltages, current in the forward direction was found to obey the diode equation and the conduction was operated by thermionic emission mechanism. While for relative higher voltage, conduction was dominated by a space-charge-limited conduction mechanism with single trap level of 0.36 eV. On the other hand, the carrier generation-recombination process limits the reverse current. Also, various electrical parameters were determined. The junction exhibits photovoltaic characteristics with open-circuit voltage (V_{oc}) of 0.32 V, a short-circuit current (I_{sc}) of 186 μA and a power conversion efficiency (η) of 1.11%. These parameters have been estimated at room temperature and under illumination of 6 $mWcm^{-2}$.

$A1_{10}$

Switching and memory characterization of Cu-TCNQ organic thin film

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Organo-metallic semiconducting thin films of Cu-TCNQ were prepared and synthesized. *On-Off* states were observed in the *I-V* characteristics when an electric field of $3x10^4$ V/cm was applied. Switching parameters as the threshold voltage V_{th}, the switching time τ_S and delay time τ_d were evaluated and found to be 28 V, l.3ms and 4.5 μs respectively. In addition, the factors affecting these parameters were investigated. An explanation for the switching and memory mechanisms of Cu-TCNQ was furnished.

$A1_{11}$

Optical Properties of Cadmium Arsenide thin Films in Infrared Region

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The optical properties of Cd_3As_2 thin film in the infrared region, (wavelength beiween about 1.6 μm to 10 μm or an energy range about 0.05 eV to 2.0 eV) have been studied by measuring the transmission T using a Pekin Elmer, system 2000 Fourier transform infrared spectroscopy (FTIR). The Cd_3As_2 films were deposited on to varies type of substrates such as NaCl, KCl and Corning 7059 glass substrate at the rate of 0.5 nm s^{-1} with different thickness and substrate temperatures at room temperature and 453 K. The transmission data of the films as a function of wavenumber ($1/\lambda$) were recorded and plotted for the analysis. The value of the refractive index n_1 of the Cd_3As_2 film deposited at 300 K was found to be 5.3 and 5.6 was obtained for the film deposited at 453K.

$A1_{12}$

Preparation of 1-D Quasiperiodic Photonic Lattice Using Vapor Deposition

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Photonic crystals are a class of artificial structures with a periodic dielectric function, in which the propagation of electromagnetic waves within a certain frequency band is forbidden. This band has been dubbed photonic band gap. The position, width, depth, and shape of the photonic band gap depend on the periodicity, symmetry properties, dielectric constant contrast, and internal lattice structure of the unit cell. Reducing the refractive index of the materials from which the photonic crystal is fabricated would reduce reflections. However, this creates a paradox since the formation of the photonic band gap is governed by the contrast in refractive index between the materials. Nevertheless, changing the geometric parameters will compensate for the decrease in refractive index. The band gap can be restored in materials with a low refractive index by increasing the number of degrees of symmetry in the lattice. Quasiperiodic structures have a photonic band gap whatever angle the light travels. Moreover, they allow a photonic band gap to form in materials with a low refractive index. We have fabricated 1-D quasiperiodic photonic lattice using thermal evaporation technique. Quasiperiodic multilayers of CdO and SnO were deposited on glass and fused silca. The deposited films were treated thermally at different temperatures to reach the desired lattice. Transmission and reflectivity were measured in the range of 190 – 2500 nm. The results will be discussed herein.

$A1_{13}$

Electron and Hole Confinement States in Quantum Dot Disc

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The ground states of both an electron and hole in a finite potential quantum disc are calculated. Numerical solution of Schrodinger equation for the two particles separately, we calculated the first two excited states for each one. To study the effect of the dimensionality on the eigen energies, we considered different discs with different values of R (radius) and L (width). Discussing the potential effect, we examined the eigen-values behavior at different value of the barrier heights. The corresponding wave functions are obtained.

Session B1

Monday, February, 22, 2004
(18:00-19:30)

Chairmen

Prof. Dr.: Y. Badr
Prof. Dr.: S. Negm

$B1_1$

XUV-Laser gain calculation for boron like Ne VI, Na VII, Mg VIII and Al IX ions

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Rate coefficients for electron impact excitation, deexcitation and total depopulation of the excited ions Ne VI, Na VII, Mg VIII and Al IX of the born isoelectronic sequence are calculated according to the analytical formulas of Vriens and Smeets. A simple modification has been made by substituting effective quantum numbers in Vriens formulas to be applicable for the ions under consideration. The energy levels are calculated using Hibbert's configuration interaction- computer package (CIV3). Level population densities are then calculated by solving the coupled rate equations involving nine levels. Positive gain coefficients are displayed for the transition 1s2 2s2 3p (2P)→ 1s2 2s2 3s (2S) at three selected electron temperatures namely ¼, ½, and ¾ the ionization energy of each ion.

$B1_2$

Dielectronic Recombination Cross Section and Rates Coefficients for Ar Ions with L-Shell Excitation

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Dielectronic recombination cross. section (σ^{DR}) & and. rate coefficients (σ^{DR}) involving 2s- and 2p- electrons excitations are estimated. The relationship between dielectronic recombination and resonant transfer excitation cross sections is discussed. The resonant transfer excitation process results the doubly excited intermediate state decay by emission of an Auger electrons or by emission of photon (radiative transition). The calculated cross section for the $Ar^{(8+,11+,13+)}$ are studied as a function of the continuum electron energy. The maximum values of the cross section for L- shell excitation of these argon ions are found increase as the degree of ionization increase. The rate coefficients are also obtained as a function of the degree of ionization. With 2s- shell excitation the rate coefficients observed increase with the increasing the degree of ionization. The σ^{DR} values with 2s-excitation are changed from 2.4lxl0^{-12} cm^3/sec. to $3.47x10^{-11}cm^3$/sec. While, the $\sigma^{DR}$with 2p-excitation decreased as the degree of ionization increased and the values are changed from $1.75x10^{-11}$ cm^3/sec to $7.78x10^{-12}$ cm^3/sec. Finally, the present data for L-shell excitation shows the σ^{DR} and σ^{DR} increase as the degree of ionization increase.

$B1_3$

A Study on Some Properties of Polyethylene-Nitrile Rubber Blend by Positron Annihilation Lifetime Spectroscopy

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Positron Annihilation Lifetime Spectroscopy (PALS) is used to study a polar Nitrile Rubber (NBR) blended with pure and waste polyethylene (PE) low and high density. The effect of weight percentage of rubber added to PE is investigated. It has been found that, a complicated variation (positive and negative) in both free volume parameters I_3) from the values of the initial polymers forms an immiscible blend. These results are supported by a significant broadening in the free- volume hole distributions. This could be interpreted in terms of interfacial spaces created between boundaries of two phases. Furthermore, a conelation was established between free-volume parameters (τ_3, I_3) and electrical and mechanical properties of the above mentioned blends as a function of weight percent of waste PE.

$B1_4$

Numerical Analysis ON Dispersion- Managed Solitons Propagating in A Fiber Link

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The variational method is a useful tool that can be used for design and optimization of dispersion-managed communication systems. Dispersion management has proved to be an efficient and promising method to be used both in ultralong transmission and for upgrading installed links at high bit rates. Using this powerful tool, we evaluate the characteristics of a carrier signal for certain system parameters and describe all the features of a dispersion-managed breathing soliton like pulsewidth, frequency chirp, spectral bandwidth, etc.

$B1_5$

Investigation of Deep-Level Centres in Er-implanted p-type Silicon

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The nature and thermal stability of electrically active defects created by Er implantation in p-type silicon which was implanted with a low dose of 1.l x $l0^{11}cm^{-2}$ Er ions at 380keV have been studied by Deep Level Transient Spectroscopy (DLTS). Defects found were the divacancy, VV, at Eν+156 eV, a carbon- and oxygen-related defect at Eν+0.34 eV, which has been attributed to a C-V-O complex and a defect level labelled X with an energy level of Eν+0.52 eV. The diväcancy was observed at low concentration after implantation, but its concentration increased with heat treatment and its energy was shifted to Eν+.019 eV after annealing at 300°C. Annealing at a higher temperature remove the divacancy. The C-V-O complex was stable up to 180°C, but it dissociated after annealing at 300°C, to release vacancies which joined together, increasing the concentration of divacancies, leaving the oxygen and carbon atoms as C_iO_i complexes with a deeper energy level at Eν+0.38 eV. This transformation is suggested in this study for the first time to explain the disagreement found in literature for these defects. The X peak includes at least two different defects, the more stable one may be the B_SB_i complex, which can survive up to 550°C. Hydrogen passivates the divacancy, the C-V-O complex, the C_iO_i complex and the component ascribed to the B_SB_i complex of defect X suggesting that all these have dangling bonds. Comparison of C-V profiles and DLTS spectra reveals that it is possible to identify which levels are responsible for carrier removal. Laplace-DLTS measurements showed very complex spectra at \ range of temperatures implying the formation of defect clusters. Hence, using of this high res method to analyse the defects produced by Er irnplantaiion into the p-type Si sample under study is not possible.

$B1_6$

Dynamics of Pumping Laser Diodes Under Optical Feedback in Fiber-Amplifier Systems

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In recent generations of long-haul optical-fiber communication systems, the communication distance is increased by periodic amplification of the optical signal by means of optical amplifiers. The amplifier works to optically compensate attenuation of the signal on propagation down fibers without changing the signal to electricity, such as the case of electronic repeaters. Laser diodes emitting in wavelength of 980 nm are commonly used as pumping sources in such systems. Noise on the pumped signal is an important issue of the fiber-amplifier systems as it is amplified with the signal along the transmission path. Stable operation and low-noise levels of laser diodes are, therefore, favorable properties for such applications. Laser dynamics, however, may be dramatically changed due to strong optical feedback from in-fiber gratings, which are utilized to tune the pumping wavelength and to increase the pumping power. Exploring optimum operating conditions and parameters of the amplifier-system configuration that correspond to stable output of the pumping lasers is prerequisite of the system. In this work, we study dynamics of pumping lasers under optical feedback in optical amplifier systems. The study is based on a newly developed theoretical time-delay model applicable under arbitrary strength of feedback. Although we assumed the laser be injected with a dc-current, the results indicated that the laser exhibits continuous wave, quasi-periodic, chaotic, or pulsing operation depending on strength of the feedback as well as the operating conditions. We characterize the laser output and noise levels in these feedback-induced operations. Comparison of the predicted results with experimental observations is also presented especially under strong optical feedback.

$B1_7$

X-Ray Photoelectron Spectroscopy of $BaTiO_3$ Thin Films Deposited on Silicon

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X-ray photoelectron spectroscopy (XPS) study of composition of $BaTiO_3$ thin films deposited on silicon by sol-gel technique was investigated. The spectral analysis of XPS data showed that Ba ions in $BaTiO_3$ thin films consist of one phase corresponding to one electronic state, which we call the b-phase. With our preparation conditions, we can prepare $BaTiO_3$ thin films with Ba electronic states as in bulk $BaTiO_3$. During Ar+ sputtering a mixture of the different oxidation states Ti^{+2}, Ti^{+3}, Ti^{+4} of titanium are present as established by XPS. The concentration of Ti^{+3} increases with increasing annealing temperature. For thin films annealed at 675°C the atomic concentration of Ti^{+3} is of the order of that of Ti^{+4}. The binding energy of the oxygen O1s main peak increases with the number of sputter cycles. Oxygen terminating the oxide surface is bound differently from subsurface oxygen. Outer-layer oxygen is less negatively charged than in the normal oxide state. X-ray diffraction patterns and XPS analysis of the annealed films showed that films annealed at 600°C for 2 h. have high crystallinity, the desired stoichiometry and less Ti^{+3} defects.

$B1_8$

Solar-pumped Solid-State GSGG: Cr, Nd, Laser Systems

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Solar- pumped lasers are candidates for a broad variety of applications, such as wireless power transmission in space, free space optical communications, and photochemistry. The first experiments of laser-pumped solid state crystals were carried out on CaF_2 doped with Dy^{2+} ions at 2.36 μm at low temperature in the mid 1960s. Since that date, the interest in crystalline lasers pumped by solar radiation has undergone a rapid development. Recently, an output power of several hundred watts of CW has been achieved in a Nd^{3+} -doped laser crystals. In the present paper, the Ti^{3+}: Sapphire laser crystal pumped by solar radiation is investigated. The optical absorption of this laser system consists of a large broad band that corresponds to the vibronic transitions $^2E \rightarrow {}^2T_2$, situated in the visible range and falls completely within the solar spectrum. In contrast to the Yag:Nd^{3+} laser, the emission spectrum of the Ti^{3+}: Sapphire laser crystal is situated in the visible-near infrared range and is suitable for wavelength tunable laser operation over hundreds of nanometers. The stimulated emission cross-section was calculated from the spectroscopic data and found to be 3.08×10^{-19} cm^2 at the peak of the spectrum. This study shows that the excited state absorption in this laser system is nonexistent. The study also includes the investigation of the solar pumping possibility in the Gd3Sc2Ga3O12 (GSGG) laser crystal co-doped with Cr and Nd ions. The transition metal ion, Cr^{3+}, with its broad absorption bands, absorbs more efficiently the solar radiation and transfers the energy to the active Nd^{3+} ion.

B1$_9$

Thermal Stability and Dielectric Relaxation of NRlsoda lignin and NR/thiolignin Composites

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The influence of soda lignin and thiolignin on the mechanical properties (tensile strength and elongation at rupture) as well as on the dielectric properties (conductivity σ, permittivity ε', dielectric loss ε" and dielectric relaxation time "τ") of their composites with natural rubber (NR) was investigated. All measurements were carried out on NR, NRlsoda lignin (20 phr) and NR/thioli (20, 30 and 40 phr) composites. The mechanical properties reveal that NR/thiolignin composite possesses the best thermal stability and 20 phr is the optimum thiolignin loading. The dielectric study was carried out over a frequency range from 100 Hz to 100 kHz at temperature range from 20 to 80°C. Dielectric data were fitted in the frequency domain using Havriliak-Negami and Fröhlich functions in addition to the conductivity term. The different relaxation mechanisms in the system were also discussed according to these functions.

$B1_{10}$

The Dust Plasma Effect on the Etching Process of Si in low Pressure Discharges

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The etching processes of Si [1 0 0] wafer has been studied using low frequency RF plasma (1KHz) by two different techniques namely: ion etching using inert gas only (e.g., argon gas), and ion chemical etching using an active gas (beside the inert gas) such as oxygen. Calculation of the different parameters produced by plasma etching for silicon wafer coated with photoresist (sample) were also investigated. In the case of large dust particle , the dust might act as a floating body in the plasma collecting equal fluxes of electrons and ions. The rate coefficient for collection of electrons and ions by dust (K) is calculated here, The presence of dust, however, may itself cause loss process. Moreover several techniques are introduced here to avoid substrate damage including increasing plasma density without increasing the Kinetic energy of the ion bombardment. Furthermore some few precautions are given here to insure good media for the Si wafer prepared for etching .

$B1_{11}$

Raman Spectra of Metal Doped Se Amorphous Alloys

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An extensive study of the Raman spectra of thin films of both pure Se_8Te_2 and metal doped by Sn, Cu and Ag is presented. Bulk Se_8Te_2 alloy was synthesized by the standard melt quenching technique. The different metals were added to the melt of the binary composition Se_8Te_2 to form the ternary system $(Se_8Te_2)_{0.9}X_1$ (where X= Sn, Cu and Ag). Changes in the characteristic Raman spectra associated with thermal treatment at temperature below the SeTe glass transition temperature Tg, were recorded and discussed in relation with the structural aspects of the studied compositions. A correlation is also established between the changes in the optical absorption, and hence the optical energy gap, due to thermal treatment and the associated structural changes.

B1$_{12}$

Vibrational Dynamics of $Ca_{70}Mg_{30}$ Metallic Glass

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The vibrational dynamics of $Ca_{70}Mg_{30}$ metallic glass has been studied at room temperature in terms of phonon eigen frequencies of longitudinal and transverse modes employing three different approaches proposed by Hubbard-Beeby (HB), Takeno-Goda (TG) and Bhatia-Singh (BS). Our recently proposed model potential is employed successfully to explain electron-ion interaction in the metallic glass. The effective pair potential is used to generate the pair correlation function g(r). The present findings of phonon dispersion curve are found in fair agreement with available theoretical as well as experimental data. The thermodynamic and elastic properties viz. longitudinal and transverse sound velocities, isothermal bulk modulus, modulus of rigidity, Poisson's ratio, Young's modulus and Debye temperature are also investigated successfully.

B1$_{13}$
The Phase Probability for Some Excited Binomial States

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In this paper, the phase properties in Pegg-Barnett formalism are considered. The phase distribution is calculated and discussed for the excited binomial state, the even-excited binomial state and the odd-excited binomial state.

$B1_{14}$

Real Time Observation of the Crystallization of Natural Rubber. NMR Spin-Diffusion Experiments

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The amount and size of crystallites were observed during the crystallization process in natural rubber at -10 ^{o}C by methods of NMR. Bloch decays recorded as a function of time were evaluated with respect to a mobile and rigid fraction corresponding largely to amorphous and crystalline components, respectively. This has been performed through fitting them to a model function. This function contains a theoretical term describing the relaxation of the rigid/crystalline fraction. The contributions to the fitting function corresponding to mobile/amorphous components were obtained experimentally using the Goldman-Shen sequence. This sequence was also used to measure data as a function of the mixing time. An analysis with respect to spin diffusion of magnetization from amorphous to crystalline domains provided the length scale of crystallites d_{rigid} seen by a diffusion-like process. No apparent growth of d_{rigid} was found during the course of the crystallization of natural rubber.

$B1_{15}$

Numerical Simulations of Coarsening of Lamellar Structures: Applications to Metallic Alloys

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Understanding the microstructural evolution in metallic alloys helps to control their properties and improve their performance in industrial applications. The emphasis of our study is the coarsening mechanisms of lamellar structures. Coarsening of lamellar structure is modeled numerically using Monte Carlo Potts method. The initial microstructure consists of alternating lamellae of phase A and phase B with the spacing proportional to their volume fraction. Faults are introduced to the lamellae to induce instability in the system. We find that an isotropic lamellar structure degenerates via edge spheroidization and termination migration into nearly equiaxed grains with a diameter which is 2 to 3 times larger than the original lamellar spacing. The duration of this process is comparable with the time it would take Ostwald ripening to produce grains of the same size. Eventually grain growth reaches the asymptotic regime of coarsening described by a power-law function of time. Lamellae with anisotropic grain boundaries coarsen more slowly and via discontinuous coarsening mechanism. This produces larger grains upon degeneration of lamellae. Discontinuous coarsening was observed in lamellar alloys as well as termination migration.

$B1_{16}$

Oxide Confined Vertical-Cavity Surface-Emitting Laser Diodes for Optical Fiber Communications

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The selectively oxidized vertical-cavity surface-emitting semiconductor laser (VCSEL) acts as a light source of great scientific and commercial interest because it offers a number of favorable properties like low lasing threshold current, dynamic single-mode operation, low divergence circular beams, high packing density, and high-speed current modulation for multi-G bit/s data generation. It acts as a source for optical fiber systems, which form the backbone of modern telecommunication systems. For example, it has become prospective candidates for transmitters in high bit rate fiber links, since data rates up to 12.5 Gbit/s with bit error rates below 10^{-11} are achieved. VCSELs can be designed for emission wavelengths in the range from 850 to 980 nm or even extended to 1300 nm, depending on the semiconductor compounds used as active media in the inner cavity. In this range of wavelengths, silica fibers have extremely small losses of less than 1 dB/km. In optical communication systems, glass fibers represent the media through which the light can be transmitted. This work presents some characteristics of single- and multi-mode fibers in combination with single-mode VCSELs from theoretical as well as experimental point of view. Under continuous wave (cw) operation of VCSELs, these characteristics include the coupling efficiency and mode losses in single-mode fibers. In addition, the effect of optical feed-back induced phase on the coupled optical power from VCSEL into fibers under cw operation and signal modulation is studied.

$B1_{17}$

Effect of the Spectral Half Width of the Driving Field on the bisability

M. M. El-Nicklawy, A.F. Hassan, S. M. M. Salman, and A. Abdel-Aty.

Department of physics, Faculty of Science, Helwan University, Cairo, Egypt.

The bistability of a nonlinear absorbing medium inside a Fabry-Perot resonator driven by an external quasi-monochromatic field is studied. The driving field is considered to be of a Gaussian and Lorentzian spectral line profile. The effect of the spectral half width on bistability is discussed. The mathematical treatment is carried out through an interferometric point of view. The dependence of the driving intensity required to initiate bistability on the standing wave established inside the resonator is represented.

Session A2

Tuesday, February, 23, 2004
(18:00-19:30)

Chairmen

Prof. Dr.: M. Mohsen
Prof. Dr.: N. Raslan

$A2_1$

Infra-red and magnetic studies of Nb-substituted Li-ferrites

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Polycrystalline $Li_{0.5+X}Nb_XFe_{2.5-2}XO_4$ samples (x= 0.00, 0.05, 0.10, 0.15 and 0.2) were prepared using the standard ceramic method. It is found that, the substitution of Nb up to x = 0.1 improves the magnetization and initial permeability, while these properties are decreased for x > 0.1. Our results are explained assuming that, for $x \leq 0.1$ Nb ions occupy the tetrahedral sites. However for higher Nb concentration, the Nb ions reside at the grain boundaries. IR absorption spectrum supports the proposed Nb cation distribution.

$A2_2$

An investigation of Substituted M-type Hexagonal Ferrite by Using X-ray and Mössbauer Spectroscopy

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b Chemistry Department, The Royal Veterinary and Agricultural University, Thorvaldsensvej 40, DK-2800 Lyngby, Denmark.

Two series of polycrystalline substituted M-type hexagonal ferrite has been synthesized, and studied by means of x-ray diffraction and Mössbauer spectroscopy. The first series have the formula "Ba Co0.5x Zn0.5x Tix Fe12-2x O19" (with x=0.0, 0.4,0.8,1.2,1.6,2.0) . The scand series have the formula (Ba Crx Fe12-x O19) (with x=0.0, 1.0, 2.0, 3.0, 4.0,and 5.0). X-ray diffraction studies improve that all the samples has a single phase M-type hexagonal structure. For the first series, the lattice parameter a was found to be approximately composition independent, while the parameter C is dependant. For The scand series, both a and c were found to be composition dependant. This observation was attributed to the atomic radii of the substituted cations. Mössbauer spectra obtained at room temperature were found to be substitution dependant. With increasing substitution the Mössbauer spectra change from magnetically ordered (x=0) towards magnetically ordered with strong line broadening (X= 0.4 to 1.6) to nonmagnetic (x=2.0), due to decreasing of Curie temperatures. Differential line broadening and relative area of components indicates that for small values of x, substitutions occur preferentially in 4f1 and 4f2 sites indirectly affecting Fe in the 12k site (cause splitting in the 12k site observed for the Co substituted series). For Cr substitution no splitting observed in the 12k site. The Mössbauer parameters were given verses composition.

$A2_3$

Structural and Magnetic Susceptibility Studies of Fe_2O_3 Nanoparticles Dispersed in a Silica Matrix Prepared by sol-ge1 Technique

H. H. Afify, I. K. Battisha and I. M. Hamada

National Research

Structural and magnetic characteristics of silica gel incorporated with (5 - 40 wt % Fe_2O_3) and prepared by sol-gel method, using tetra-ethoxysilane as precursor material. The prepared samples were submitted to thermal treatments in the temperature ranging from 200 up to 1150°C. They were investigated through XRD, TEM, SEM, ESR and magnetic susceptibility measurements. The samples treated at low temperatures have an amorphous phase and show anti- ferromagnetic properties. At 900°C a lot of γ-Fe_2O_3 crystalline ferrimagnetic nano-particle are formed, while a further increase of the temperature results in the γ to α- Fe_2O_3 transformation. The variation of iron oxide content affects the abundance of γ- Fe_2O_3 formation, which reaches the maximum percent values in the more dilute samples. In the more concentration samples, while the amount of maghemite is still growing, antiferromagnetic α-Fe_2O_3 begins to form. As a consequence, the saturation magnetization lowers in the samples with higher Fe_2O_3 content. Also, interparticle interactions, evidenced by fitting susceptibility values versus temperature, contribute to such a decrease.

$A2_3$

Second order magnetic phase transition in RCo_9Si_4 (R = Sm, Gd and Tb)

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Specific heat, magnetization and resistivity measurements were performed on the polycrystalline samples of the ternary compounds RCo_9Si_4 (R = Sm, Gd and Tb) in order to investigate the thermodynamic and transport properties. The low temperature results reveal the onset of ferromagnetic order at Curie temperatures T_c varying between 30 and 50 K for RCo_9Si_4 in the region of the Sm to Tb compounds. The electrical resistivities in the ordered state (below $T_C/2$) is in reasonable agreement with the quatratic temperature dependence expected for ferromagnetic spin waves. Thermodynamic and transport data of the ordered ternary compounds reveal a second order phase transition from paramagnetic to the magnetic ordered state which can clearly be derived from the kinks like anomalies in the resistivity data and the jump like anomalies in the specific heat measurements.

$A2_4$

Magnetism and Structure Characteristics of $GdCo_{13-x}Si_x$ Compounds

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The magnetic and structural properties of the $GdCo_{13-x}Si_x$ compounds were studied by means of x-ray diffraction, ac susceptibility and resistivity measurements. The X-ray powder diffraction indicates that the solid solution of pseudobinary alloys crystallises in a three different types of crystal structure. For $x < 3$, the $GdCo_{13-x}Si_x$ alloys were found to have a disordered face-centered cubic (FCC) $NaZn_{13}$ – type structure. For $3 < x < 3.6$, with increasing Si content, coexistence of disordered cubic and ordered or partially ordered tetragonal structure is obtained. Finally, at high Si content, $3.8 < x < 4.5$, the diffraction lines of the cubic phase are split completely, and almost single phase samples of body-centred tetragonal (BCT) $CeNi_{8.5}Si_{4.5}$ type structure ($NaZn_{13}$-derivative) were obtained. The ac susceptibility as well as the resisitivity data exhibit a ferromagnetic behaviour with Curie temperature T_C in the range 20-100 K. The alloys with $x > 3.5$ show spin reorientation at cryogenic temperatures.

$A2_5$

Performance of rubber seal materials under prolonged exposure to high energy radiation

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The physical properties of materials are of critical importance for the design, production, and quality control of the end products. The rubber-rubber blends are widely used in industry as class of materials that achieved their quality characteristics with the attainment of optimum condition by the suitable selection of some additives. The addition of p-phenylene diamine (IPPD) with its optimum concentration has resulted mostly in enhancing the radiation resistance of rubber materials. Physicomechanical tests are performed to measure the ageing behavior due to the deterioration effect of prolonged exposure of γ-irradiation up to high doses. The swelling test at different solvents is relatively simple to be measured precisely and useful as a quality control test. Stress-strain measurements are found to improve the performance of resistance to high-energy radiation up to 1200 Mrad. The SEM images have observed the surface cracks of the blends and their changes due to the prolonged exposures of γ-irradiation up to high doses while the bulk has no cracks.

$A2_6$

Effect of Pb Content On Magnetic And Transport Properties of $Bi_{2-x}Pb_xSr_2Ca_2Cu_3O_{10+\delta}$ Superconducting Ceramics.

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$Bi_{2-x}Pb_xSr_2Ca_2Cu_3O_{10+\delta}$ (Bi(Pb)-2223) (x varying from 0 to 1) superconducting ceramic samples have been prepared with different amounts of Pb by the standard solid state reaction method. X-ray Diffraction (XRD), magnetization measurements and transport critical current density measurements were used to investigate the microstructural and superconducting properties of Bi-2223 samples. Results show a dependence of the transport critical current versus the Pb content. The effect is explained as a consequence of the lead content on the doping level.

$A2_7$

Optical and Magneto-optical Properties of PrSb and PrAs

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We present the results of a theoretical study of the optical properties of PrSb and PrAs using the full potential linearized augmented plane wave (FPLAPW) method using the Perdew and Wang generalized gradient approximation which is based on exchange correlation energy optimization. We calculate the frequency dependent dielectric function and related optical constants such as reflectivity absorption spectra energy loss and refractive index. We present a detailed comparison of our result with other calculation and existing experimental data. Results are also presented for the Magneto-optical Kerr effect in both compounds. We also do parallel comparison of the optical properties of PrSb and PrAs.

$A2_8$

Husk-Wheat : Renewable Sources of Reinforcing Materials for Elastomer Based Composites

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Wheat husk is regarded as an agricultural waste that suggested an important low cost and environmental friendly filler derived from a renewable source. It has been incorporated into ethylene-propylene-diene terpolymer (EPDM) to prepare the composite using a conventional mechanical mixing method. Chemical treatments of the fibers by several methods such as alkali and acetylation treatments were used to modified their surfaces. Cure characteristics and physical properties of vulcanizates were studied with respect to untreated vulcanizates at constant loading (30 phr). Thermogravimetry was used to determine the thermal stability of the fibers. Such improvements were attributed to surface coating of the fibers when EPDM was used. The mechanical performance of the fibers was also investigated.

$A2_9$

Optical and Magneto-Optical Properties of Elemental Gd

Sapan Mohan Saini, Nirpendra Singh , T. Nautiyal , and S. Auluck

Department of Physics, Indian Institute of Technology Roorkee, Roorkee-247 667

Rare earth metals and compounds have attracted a considerable attention due to their anomalous properties, such as valence fluctuation phenomena. They are of great practical interest and draw much attention due to very large Kerr rotations, the most extreme example is CeSb, where the Kerr rotation reaches its maximum possible value of 90^0. To get an insight we report the calculations of optical properties of Gd, a ferromagnetic rare earth element, using the full potential linear augmented plane wave (FPLAPW) method. Calculations have been carried out using generalized gradient approximation (GGA). Density of states, optical and magneto-optical properties are calculated and comparison made with other theoretical works and existing data. Our results are consistent with the experimental results.

$A2_{10}$

Pseudopotential in the Study of Superconducting State Parameters of Metallic Glasses

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A recently proposed model potential is used to study the superconducting state parameters viz. electron – phonon coupling strength λ, Coulomb pseudopotential μ^*, transition temperature T_C, isotope effect exponent α and effective interaction strength N_OV of forty metallic glasses of simple, non – simple as well as transition metals. The advanced screening function due to Sarkar et al has been employed to include the exchange and correlation effects. Instead of Vegard's law, the use of pseudo-alloy-atom model in the investigation of superconducting state properties of metallic glasses is proposed and found successful.

$A2_{11}$

Inorganic Nanotubes: Synthesis and Applications

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The first MoS_2 and WS_2 synthesized by chemical transport reaction have been prepared in 1995, only few years after discovery of inorganic nanotubes [1]. The advantage of lasting transport reaction is in the fact that the so-grown nanotubes contain extremely low density of structural defects [2]. The MoS_2 and WS_2 nanotubes have been successfully alloyed with gold, silver [3] and copper. The existence of noble metal-MoS_2 ternary compounds gives evidence that the cylindrical geometry of crystals can stabilise new compounds otherwise unknown in a plane geometry. The sub-nanometer $MoS_{2-x}I_y$ nanotubes have been synthesised using C_{60} as a growth promoter [4,5]. The potential applications of inorganic nanotubes range from high porous catalytic and ultra light anticorrosive materials to non-toxic strengthening fibers. The bundles of sub-nanometer diameter nanotubes can be reversibly doped with lithium and have been shown to be a very promising electrode material for Li-batteries [6]. Their small diameter and metallic behaviour makes them promising also for field emission [7] and in biological devices.

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[4] M. Remskar et al., *Science* 292 (2001) 479;
[5] M. Remskar et al., Adv.Mater. 15 (2003) 237;
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[7] V. Nemanic et al., Appl.Phys.Lett. 82 (2003), 4573.

$A2_{12}$

Multiple Andreev Reflection in Quantum Dot Coupled Weakly to Superconducting Reservoirs

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We derive an expression for the thermopower for a mesoscopic device. This device is modeled as semiconductor quantum dot coupled weakly to two superconducting reservoirs via a tunnel barrier. The tunneling probability is derived using the Bogoliubov-deGennes equation (BdG) taking into consideration the effect of Coulomb blockade and the influence of magnetic field. The barrier height has been determined by Monte-Carlo simulation technique. Our results show the following features: The Phase coherent property of the present device, The resonant tunneling trend to the magnetic field dependence of the thermopower. This resonant behavior might be due to the multiple Andreev reflection at the interface and Coulomb oscillation due to Coulomb charging energy. Our results agree qualitatively with those in the literature.

$A2_{13}$

Effect of Pb Content On Magnetic and Transport Properties of $Bi_{2-x}Pb_xSr_2Ca_2Cu_3O_{10+\delta}$ Superconducting Ceramics.

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$Bi_{2-x}Pb_xSr_2Ca_2Cu_3O_{10+\delta}$ (Bi(Pb)-2223) (x varying from 0 to 1) superconducting ceramic samples have been prepared with different amounts of Pb by the standard solid state reaction method. X-ray Diffraction (XRD), magnetization measurements and transport critical current density measurements were used to investigate the microstructural and superconducting properties of Bi-2223 samples. Results show a dependence of the transport critical current versus the Pb content. The effect is explained as a consequence of the lead content on the doping level.

Session B2

Tuesday, February, 23, 2004
(18:00-19:30)

Chairmen

Prof. Dr.: S. Allam
Prof. Dr.: S. El-Dessoki

$B2_1$

Preparation and Characterization of CdSe Single Crystal

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Physics department, Faculty of science, Helwan University, Cairo, Egypt

High quality of CdSe single crystal is grown from the melt. X-ray fluorescence (XRF) showed that the ingot crystal has Cd:Se ratio very close to 1. The Photoresponse spectra in the energy range 1.2- 2.1 eV is found to change with increasing temperature from 80 K to 300 K. At temperatures ≤ 200 K three peaks are observed at 1.45; 1.73 and 1.97 eV; whereas above 200 K, the peaks at 1.45 and 1.97 eV are washed out. These peaks are interpreted in terms of the band model, considering the band splitting. The photocurrent-temperature behaviour showed three main regimes: a weak dependence at lower temperatures; thermal quenching region (maximum at 200 K) and a marked decrease at higher temperatures. The onsets and offsets of the three regions are found to depend on the incident photon energy. A very high lifetime (milliseconds); being temperature dependent is obtained from the frequency resolved photoconductivity. The data are explained on the bases of recombination kinetics controlled by defect centres.

$B2_2$

Optical Nonlinearities and all Optical Switching in Porous Silicon

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The sign and magnitude of both real and imaginary parts of x(3) have been directly measured for pours silicon, using z- scan technique, enhancement of x(3) over crystalline silicon by over one order of magnitude is reported . This large nonlinearity will provide the basis for the use of this type of material in nonlinear devices such optical switching and optical limiters. All optical switching demonstrated experimentally based on the absorption changes which has the advantages of relatively fast response time and mirrorless structure.

$B2_3$

Influence of Thermocycling Process on Optical Properties of the $TlInS_2$ Semiconductor.

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Layered crystals of the $TlInS_2$ compound have phase transitions from paraelectric phase with space group symmetry C_{2h}^6 to an incommensurate phase and from the incommensurate phase to a ferroelectric commensurate phase at temperatures 216 K and 201 K respectively. The anomalies of physical properties are also observed at 170 K. The goal of present work is the investigation of influence of thermocycling process on temperature dependencies of second harmonic generation (SHG) and optical absorption in the vicinity of two-phonon state zone of the $TlInS_2$ crystals. It was shown that at the first cycle of cooling and heating the SHG signal was registrated at all configurations of experiment in the 170 K - 201 K temperature interval. The transmission maximum at 870 cm^{-1} is observed in absorption spectra. Moreover, the additional absorption band with thin structure and the maximum of absorption at 800 cm^{-1}, having the most value at 182 K, was observed at the same temperatures. At subsequent thermocycles in the same day the indicated peculiarities of spectra relaxed. At the fourth cycle the SHG signal in the 170 K - 201 K temperature range was observed only at the same configurations of experiment, which took place below 170 K, and only ordinary two-phonon bands were done in the absorption spectra. The restoration of an initial picture of temperature dependencies of spectra had been occurred in three days with the exposure of a sample at room temperature. The experimental results are explained by the formation of the regions of the incommensurate phase at 170 K - 201 K temperatures and their interaction with mobile defects in the real $TlInS_2$ crystals.

$B2_4$

Solar Cells Parameters Evaluation from Single I-V Plot

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This paper presents a simple and successful method for evaluating the series resistance, the ideality factor, the saturation current and the shunt conductance in solar cells. The approach involves the use of an auxiliary function and a computer-fitting routine. The validity of this method has been confirmed by the way of current-voltage measurements of a commercial solar cell and a module.

$B2_5$

On Creep Behavior of Copper Nano-Powders Reinforced Tin-Antimony Conventional Solder

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Creep behavior of composite solders that prepared by the addition of copper nanopowders (average particle size 100 nm) to the blend of an eutectic solder tin (Sn)-antimony (Sb) was investigated. The blended solder was exhibited an universal pseudogap behavior at the vicinity of the phase transformation temperature point ($T \simeq 443$ K) where the copper powders are precipitated as intermetallic compound that are distributed nonuniformly through the pseudogap of the microstructure. The strain rate sensitivities and the apparent activation energies were determined to characterize the dislocation climb along the grain boundaries and the diffusion of Cu precipitates in the Sn-Sb phase. X-ray analysis confirmed the universal pseudogap behavior during the creep process.

$B2_6$

Erroneous Practice in Spectrophotometric Determination of Optical Properties of Semiconductor Thin Films

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There has been erroneous practice in determining the optical properties of semiconductor thin films, such as the film absorption coefficient, refractive index, extinction coefficient, and the bandgap energy. An example of such erroneous practice is determination of the absorption coefficient from the spectrophotometer-measured absorbance. Such an error results in miss-estimation of both the energy dependence of the absorption coefficient and the energy gap E_g; E_g of WO_2 thin films (3.1 eV) is overestimated as 3.89 eV. It is well known that the accurate determination of these properties should be done by exact solution of the Murmann's equations that relate the film transmittance, reflectance and back reflectance to its refractive index, extinction coefficient and thickness. Ignoring the influence of the errors in spectrophotometric measurements of both transmittance and reflectance on the optical constants represents another erroneous practice. We show that a 5% error in the spectrophotometric measurements of either transmittance or reflectance results in erroneous calculation of the refractive index and extinction coefficient as large as 20%. This amount of experimental errors should be taken into account when discussing the influence of film preparation conditions on the optical properties.

$B2_7$

The Structural Investigation of Amorphous Lithium Tungstate Borate Using X-ray Diffraction

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Two samples of amorphous powder lithium tungstate borate were investigated by using X-ray diffraction of Mo-source(λ=0. 709Å). The ratio of the B_2O_3 in the two samples was 35% and 40% respectively, but the ratio of Li_2O and WO_3 was always equaL The Radial Distribution Function(RDF), analysis showed that the first nearest neighbor peak of the first sample (35%B_2O_3) was found at 1.66 Å, but for the second sample (40% B_2O_3) it was observed at 1.62Å which is due to B-O pairs of stretched bond lengths arranged in form of triangles. The second nearest neighbor for the first sample was located around 2Å, while it was shjfled to about 2.27Å for the second specimen. This second peak is due to W-O pairs arranged in form of W0 in the first sample and arranged in the form of WO_2 in the second one. The next successive two maxima for the first sample were observed at 2.47Å and 3.35Å respectively, while those of the second sample were found at 2.87Å and 3.65Å. The peak located at 2.47Å for the first specimen is attributed to B-B pairs of coordination number 2, while the peak found at 3.35Å is due to B-O bonds within the boroxol group arranged in the form of BO_4. Also the peak observed at 2.87Å for the second specimen is due to stretched O-O bonds, but the peak located at 3.65Å mainly attributed to B-O pairs inside the boroxol ring having also the tetrahedral form. The O-O pairs for the first sample was found at about 2.86Å having a coordination number 2, but it was included within the peak represents B-B bonds at 2.87Å having a smaller coordination number (~1.5) in the second sample.

$B2_8$

Characterization of ZnSe Nanostructural Material Prepared by Inert Gas Condensation Method

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Thin film and powder nanostructural material has been prepared by Inert Gas Condensation method (ICC). The ZnSe deposited powder was examined by XRD technique and showed nanostructural with Cubic unit cell, while the as-deposited and annealed thin films have not ensured their ciystallinity. The transmission electron microscope study showed that as-deposited ZnSe films are ciystalline with cubic phase. The grain size of the deposited powder samples was determined by XRD technique using WinFit computer program and Fourier analysis. It was found that crystallite size is ≈ 5 nm. The energy dispersion analysis of X-ray (EDAX) showed that the ZnSe films have got the atomic ratio of Zn/Se 44.38/55.62.

$B2_9$

Dramatic Effect of Zn Ion on The Transport Properties and Intensity of The Exchange Interaction Constant of Mn-La Ferrite

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a: Physics Department, Faculty of Education, Suez Canal University, Al Arish - Egypt.

The electrical conductivity (α), the magnetic susceptibility (χ_M), and X-ray analysis, (XRD), for Zn substituted Mn-La ferrite have been studied. The lattice parameter (a), Xray- density (Dy), bulk density (D), and the porosity (P), were calculated. As a function of temperature in the range of 300 — 800 K and frequency ranging from 600 kHz - 5MIHz, the dielectric constant ($\varepsilon^{\backslash}$)and the dielectric loss factor ($\varepsilon^{\backslash\backslash}$)c for the samples have been studied. Abnormal behavior (peak), was observed at a certain temperature for all investigated samples, with a small shift due to increasing Zn content as a result of the reduction of Mn^{3+} to Mn^{2+} in the sintering process. The conductivity data shows two different regimes with large difference in the activation energies where the activation energies (E_I) were found to be higher in the paramagnetic region than that of (E_I) in the ferromagnetic region. The magnetic properties of the same disordered spinel system have been investigated through the dc susceptibility measurements as a function of the substituted ion concentration which show normal ferromagnetic behavior for $x \leq 0.5$, while for $x \geq 0.5$ it shows the existence of magnetic ordering. The Curie temperature T_C rises with Zn content up to $x \leq 0.5$, possibly due to the increase in the exchange interaction and magnetic moment. For $x \leq 0.5$, T_C decreases due to the cation distribution on A, and B sites, resulting in the weakening of A-B interaction.

$B2_{10}$

Self-Consistent Calculation of Band Energies of Diamond Structure Semi-Conducting Crystals

I.S. Sobchuk

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Band energy and wave functions are obtained from a Schrodinger equations by means of a pseudo-potential method as it allows from uniform positions to study a broad spectrum of physical properties of semiconductor. The pseudo-potential is represented as a sum of a local pseudo-potential Bertocnini - Meloni and screening components: a Coulomb potential and exchange-correlation interaction. As a Coulomb and the exchange -correlation potentials depend on distribution of an electronic density in crystal the problem of determine of the energy spectrum of crystal is necessary to solve by the means of self-consistency method. On zero iteration based on an atomic electronic density the Coulomb potential is calculated. The atomic potential, obtained at such approach, is substituted in the secular equation. Solutions of this equation will be wave functions which one has properties of periodicity of a crystal lattice. The next step of self-consistency is build-up of a crystal electronic density based on Bloch wave functions and corrections from Coulomb and exchange-correlation potentials. As the crystalline electronic density enters an exchange-correlation potential in a degree 1/3, there is a problem of calculation of matrix elements of an exchange-correlation potential, which maybe be solve with the help of approximation by the orthogonal Chebyshev polynomials . The analysis of calculations of the basic energy transitions for silicon displays that after the first iteration the satisfactory magnitudes for $\Gamma_{25}' \rightarrow \Gamma_{15}$, $\Gamma_1(1) \rightarrow \Gamma_{25}'$, $\Gamma_{25}' \rightarrow X_4$, $\Gamma_{25}' \rightarrow L_{2'}(l)$, $\Gamma_{25}' \rightarrow L_1(l)$, $\Gamma_{25}' \rightarrow L_3$' - and other are obtained.

$B2_{11}$

Addition Effect of Lanthanum Oxide on the Structural, and Optical Properties of Co_3O_4 thin Films Prepared by Spray Pyrolysis Technique

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** Solid State Physics Department, National Research Center, Giza, Egypt*

Thin films of mixed oxides with different composition of cobalt and lanthanum were prepared by the spray pyrolysis technique. The structural properties of the prepared films were investigated by using x-ray diffraction and scanning electron microscope. The optical properties were studied by using double beam spectrophotometer in the wave length range from 400nm up to 2500nm. It is found that the optical energy gap depends on value of x. The energy gap shift due to LaO incorporation was studied in terms of the band spectra of the mixed oxides.

$B2_{12}$

The Electrical Characteristics of the Au- $Bi_4Ti_3O_{12}$ –Au System

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The interest to devices on the base of thin films has increased for last decade. The achievement of thin-film technology results in development and manufacture of complex devices on the base of the semiconductor and ferroelectric materials. $Bi_4Ti_3O_{12}$ is a ferroelectric with a high temperature of the phase transition and interesting optical, piezoelectric and electrooptical properties. The research of thin films of this material will open new opportunities and will expand area of its practical application. In the present paper the structure Au- $Bi_4Ti_3O_{12}$-Au has been investigated. The system contains a thin polycrystalline film $Bi_4Ti_3O_{12}$. The film has been obtained by a magnetron sputtering method. As electrodes the gold has been used. We developed a technique of the reception of the thin films $Bi_4Ti_3O_{12}$. The current-voltage characteristic at the constant voltage, the voltage - capacity characteristics, dependence the resistance and conductivity on the voltage (at 5-200 kHz), the tangent of dielectrical losses (at $1\text{-}10^4$ kHz) have been obtained. All measurements were carried out at room temperature. Based on the obtained current-voltage characteristic the exponential dependence of current on the voltage at 0.7 -0.9 V is revealed. The nonideality factor (n=1.5), height of a potential barrier(φ =0.53eV) and the series resistance have been determined. The strong dependence of capacity and conductivity on the applied voltage corresponds meets to frequency of 5kHz.

$B2_{13}$

Nanocrystalline Anatase Titania thin Films Synthesized by Spray Pyrolysis for gas Detection

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Transparent TiO_2 thin films were successfully prepared on glass substrates by Spray Pyrolysis Technique. The obtained films are amorphous at deposition temperatures below 350°C and polycrystalline above it. The XRD patterns of these film shows nanocrystalline anatase phase. No other phases of titanium oxide are observed. The optical and electrical properties of the prepared samples at different preparation condition are studied. The sensitivity of the prepared TiO_2 films are investigated towards reducing and oxidizing gases; such as oxygen, hydrogen. and carbon monoxide. The obtained results are correlated with preparation conditions to define which allow the high sensitivity to each investigated gas.

Session P1

Monday, February, 22, 2004
(13:30-19:30)

Chairman

Prof. Dr.: M. El-Oker

$P1_1$

The Model Of Short-Range Inelastic Electron-Polar Optical Phonon Interaction In Hgte

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In work [1] the mechanism of electron - polar optical phonon scattering was considered in view of inelastic character of scattering within the framework of a precise solution of the stationary Boltzmann equation. There was exhibited that the usage of standard model of electron - polar optical phonon scattering reduces in a disagreement between the theory and experiment in temperature range T> 100 K. According to our opinion this model has following shortages: 1) the use of macroscopic parameter - permittivity- is not reasonable in microscopic processes; 2) the interaction potential of an electron with optical oscillations of a crystal lattice is long-range that contradicts the special relativity. The purpose of the present work is the build-up of such a model of scattering which at first would well agree with experiment and secondly had no the above mentioned shortages. The short-range interaction potential of an electron with polar optical phonons is found by the way of solution of a Poisson equation in the limits of one unit cell. Thus the unit cell is substituted by an orb of radius $R = \gamma\, a_0$, the magnitude which one lays within the limits from half of smaller diagonal up to half of greater diagonal of a unit cell ($0.5 < \gamma < \sqrt{3}/2$; a_0 - lattice constant). Magnitude γ =0.628 is picked such to adjust the theory with experiment. Spherically symmetric solution of a Poisson equation looks like: $\varphi = \frac{\rho}{2\,\varepsilon_0}\left(R^2 - \frac{r}{3}\right), \quad (0 \le r \le R)$. The calculation of temperature dependence of electron mobility was taken for an acceptor concentration $N_A = 10^{15}$ cm $^{-3}$ thus the contribution of heavy holes (about ~ 1%) is possible to neglect. The calculation shows that the theoretical curve is well agree with experiment that testifies that the model, offered us, adequately describes the process of electron - polar optical phonon scattering. It was established that the intraband scattering is the basic scattering mechanism in an interval T> 100 T. The contribution of interband scattering in considered temperature range can be neglected. [1]. O.P. Malyk . Nonelastic charge carrier scattering in mercury telluride. // Accepted to publication in Journal of Alloys and Compounds.

$P1_2$

Structural and IR Studies on Cu-Ni Ferrite

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A series of $Cu_{1-X}Ni_XFe_2O_4$ ferrites with $0 \leq x \geq 1$ have been synthesized employing an ordinary ceramic technique. A structural investigation of the ferrites utilizing X-ray, energy dispersion X-ray spectroscopy and infra red spectroscopy were attained. The effect of Ni doping on the lattice parameters of the ferrite was calculated and compared with the experimental values. A cation distribution, which governs most of the physical properties of the ferrite, was suggested.

$P1_3$

Electrical Properties Investigation of CuZnMn Ferrite

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**Depat of Physics, Faculty of Science, Suez Canal University, Ismailia, Egypt.*

An electrical examination for the commercial ferrite, of the chemical formula, $Cu_{0.1}Zn_{0.6}Mn_{0.3}Fe_2O_4$ at room and elevated temperatures has been performed. Both the electrical conductivity and the thermoelectric power of the ferrite were measured and annualized. It has been found that the studied ferrite behaves as an n-type semiconductor. Incorporating the conductivity and the Seebeck coefficient data; the density of charge carriers, the carriers mobility and their temperature dependence revealed. In addition the activation energy and Curie temperature were also evaluated.

$P1_4$

Thermal Stability and Dielectric Relaxation of NR/Soda lignin and NR/thiolignin Composites

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[1]Polymers Dept., [2]Microwave Physics Dept., [3]Cellulose and Papers Dept.

The influence of soda lignin and thiolignin on the mechanical properties (tensile strength and elongation at rupture) as well as on the dielectric properties (conductivity σ, permittivity ε', dielectric loss ε" and dielectric relaxation time "τ") of their composites with natural rubber (NR) was investigated. All measurements were carried out on NR, NRlsoda lignin (20 phr) and NR/thioli (20, 30 and 40 phr) composites. The mechanical properties reveal that NR/thiolignin composite possesses the best thermal stability and 20 phr is the optimum thiolignin loading. The dielectric study was carried out over a frequency range from 100 Hz to 100 kHz at temperature range from 20 to 80°C. Dielectric data were fitted in the frequency domain using Havriliak-Negami and Fröhlich functions in addition to the conductivity term. The different relaxation mechanisms in the system were also discussed according to these functions.

$P1_5$

Ultraviolet and Visible Spectroscopic Studies of Thin Films of Phthalocyanine and its complexes

R. Seoudi, G.S. El-Bahy and Z. A. El Sayed

Spectroscopy Department, Physics Division, National Research Center, Dokki, Cairo, Egypt.

Thin films of phthalocyanine and its metal complexes [manganese, iron, cobalt, zinc and lead phthalocyanine] were prepared by vacuum evaporation of its powders at a pressure of 10^{-5} Torr with thickness 80 nm. The optical absorption (A), transmission (T) and reflection (R) spectra of these films were studied in the wavelength range from 300 to 1000 nm. The optical absorption coefficient (α) and the optical extinction coefficient were directly calculated from the spectra data. The optical band gap (E_g) was determined from the absorption coefficient data. Also, refractive index (n) can be determined from the optical absorption coefficient and optical extinction coefficient. Generally, it has been found that the spectra were affected significantly by the central metal ions.

$P1_6$

Structural and Optical Properties of Thermally Deposited $(Bi_2S_3)_{1-X}$ $(PbS)_X$ Thin Films

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Physics Division, Electron Microscope and thin films,
National Research Center, Dokki, Cairo, Egypt.

$(Bi_2S_3)_{1-X}$ $(PbS)_X$ thin films with different percentages of PbS were deposited on glass substrates by thermal evaporation method. The thin films has been characterized by X-Ray diffraction studies and optical measurements. The film structure is investigated using Philips PW 1390-X-Ray diffractometer. The direct transmission spectrum of $(Bi_2S_3)_{1-X}$ $(PbS)_X$ thin films has been measured over the range from 300 nm to 2500 nm. The absorption edge shifts to higher wavelengths, this effect could be related to the grain size increase of the crystallites of films. Optical characterizations by measuring only transmitted intensities, calculate absorption coefficients [α], extinction coefficients [k], and estimate optical bandgaps lE_g]. The values of [α & k] as a function of the photon energy [hv] were obtained at various ratios.

$P1_7$

Experimental Testing of A Shallow Solar Pond With Continuous Heat Extraction

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Department of Physics, Faculty of Science, Tanta University, Tanta, Egypt

The thermal performance of a shallow solar pond (SSP) under the batch and open cycle modes of heat extraction has been investigated experimentally. Experiments have been performed during the summer season of 2001 under different operational conditions for the two modes of heat extraction. The pond performance is investigated in terms of the heat loss coefficients and the rates of energy losses and energy collected. It is found that using an additional glass cover reduces the top U_t and total U_l loss coefficients by 54% and 44%, respectively. The highest value of the rate of energy collected $\dot{Q}_{coll.}$ of 644 W has been achieved when the pond is used with double glass cover and an outer mirror. Further, the tap water is used as a fluid flowing through a heat exchanger (HE), welded to the pond absorber plate, to extract the heat under the open cycle mode. The outlet temperature of the HE's fluid T_{fo} is found to decrease with the increase of the mass flow rate $\dot{m}_f$. The maximum values of T_{fo} are found to be 55.5, 46.5 and 43.5°C when $\dot{m}_f$ equals 0.00054, 0.0030 and 0.00798 kg/s, respectively. Comparisons between the two modes of heat extraction are performed based on the efficiency and the successive operation of the pond. The long-term performance of the pond under the best operational conditions has been investigated by computer simulation for a whole year. It is inferred that the present SSP can be used as a source for the warm water required for domestic applications under climatic conditions similar to Tanta city (latitude $30^\circ 47'$).

$P1_8$

Debye's Equations for Ferroelectric Materials

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The main object of the present paper is Debye's equation for the real pad of dielectric constant and its new employment, especially, for the ferroelctric materials In this paper, the previous equation Eras been modulated into a simple model for determination the relaxation time and ,as a consquence, the activation energy of the ferroelectric materials The results which were calculated by the previous equation reveal that the phase transition temperature in ferroelectric materials characterizes with minimum value of relaxation time and the activation energy is function of the phase transition temperature and the quality o Ferroelectric materials.

$P1_9$

Dielectric Relaxation in $Ge_{1-x}Se_2Pb_x$ (x=0, 0.2 and 0.6) nano-crystalline System.

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Measurements of the ac conductivity and the dielectric loss of Pb modified $Ge_{1-x}Se_2Pb_x$ disordered system (x = 0, 0.2, and 0.6) have been carried out in the frequency range 100Hz-20KHz and at temperature from 303K to 433K. The virgin and the x = 0.2 samples data shows a normal behavior according to the relation $\sigma_{ac}(\omega) = A\omega^s$. However, the x = 0.6 sample behaves differently. The exponent (s) measured for the two modified samples shows sublinear relation depending on the temperature of measurements. The experimental results of the highly modified sample are interpreted in terms of the coexistence of two parallel conduction mechanisms; the predominance of each depends on both temperature and frequency.

$P1_{10}$

FTIR-Spectroscopy for $(Pb_{1-x}Ca_x)TiO_3$ Ceramics

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*** Physics Department, Faculty of Science, Cairo University, Egypt.*

Gradual increase of Ca-ions in $(Pb_{1-x}Ca_x)TiO_3$ ceramics is an essential technique for revealing the components of the bending band in FTIR-Spectroscopy. The results support the model of the corporation for Ca-ions in ceramics at Pb-site and the binomial distribution function of nine stoichometerics species. The general formula of the structure of unit cell in the samples of this paper is $\{[(8-N)Pb^{2+}+NCa^{2+}]+Ti^{4+}+6O^{2-}\}$, where N = 0, 1 , 2, 3, 4 , 5 , 6 , 7, 8.The wavenumbers in the bending band which are corresponding to the unit cell values of N = (0 or 8); (1 or 7); (2 or 6); (3 or 5); 4 are 390 ; 375 ; 354; 325 ;302 cm^{-1} respectively. The unit cells of types (7Pb, and (6Pb, 2Ca) are responsible for increasing the stretching frequency while the other types of unit cells are responsible for the opposite behaviour. The sample with formula$(Pb_{0.85}\ Ca_{0.15})TiO_3$ has the higher value of stretching frequency. This sample may show relative hardness properties.

$A1_{11}$

Investigation of Electrical and Thermoelectric Power in $CuInTe_2$ single Crystal

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Qena-Egypt

The electrical conductivity, Hall effect and thermoelectric power are mad for the compound $CuInTe_2$ over a wide range of the temperature. This compound grown in a single crystal form by a vertical Bridgman method. From electrical and Hall measurement, the electrical conductivity Hall mobility, hole concentration, Hall coefficient, energy gap and activation energy were calculated The effective masses of charge carriers, carrier mobilities, diffusion length, diffusion coefficient, and the relaxation time for both majority and minority carriers also were estimated from thermoelectric power measurement in conjunction with the electrical and Hall measurements.

$P1_{12}$

Optical Properties of Amorphous $Se_{90}In_{9.3}Cu_{0.7}$ Thin Films

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We have analyzed the optical properties of a-$Se_{90}In_{9.3}Cu_{0.7}$ chalcopyrite thin films; the chalcopyrite thin films were prepared by thermal evaporation. The absorption coefficient (α) has been determined from the reflectivity and transmitivity spectrum in the range 300 — 2500 nm The optical absorption data indicate that the absorption mechanism is non—direct transition with optical hand gap 1.96 eV. The oscillator energy (E_o), dispersive energy (E_d) and other parameters have been determined by Wemple - Didomenico method.

Session P2

Tuesday, February, 23, 2004
(13:30-19:30)

Chairman

Prof. Dr.: F. Abdel Salam

$P2_1$

Effect of Tin Substitution in Pb_{1-X} Sn_X Te Thin Films on Their Physical Properties

VI.A.Rafea Ibrahim , R. Labusch*, F.S. Terr and M.Mounir Saad El Din **

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** Solid State Physics, Institute of Physics and Technology, Clausthal University ,Germany*
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Lead tin telluride powder was prepared with composition, "x" from 0.0-0.4 (with a step 0.05) from the constituent elements of purity 99.999 %. Identification of the prepared materials was carried out by X-ray diffraction (XRD) and energy dispersive X-ray spectrum (EDX). Lead tin telluuride thin films were prepared from the obtained materials by electron beam evaporation technique. X-Ray diffraction and EDX analyses were carried out for the prepared thin films. A slight increase of Te content than the source powdered material was observed. The variations of the electrical resistivity ,the charge carriers concenteration and the charge carriers mobility with both composition "x", and temperature were investigated. The films showed a semiconducting behaviour. The resistivity decreases, while the carriers concentration increases with "x" increase .Optical transmission curves in the infrared wave length range were obtained for the studied films. It was shown that as tin substitutes lead the film transmittance decreases. The optical energy gap was determined ,taking in consideration Burstein - Moss shift. It was found that the optical energy gap decreases with "x" increase. From the ac photoconductivity experiment the films possess a photoconductive behaviour. The photoconductivity was studied for the films in the temperature range 100-300 K. The energy gap was determined from the photoconductivity measuurements and it slightly increases with temperature increase in the studied temperature range.

$P2_2$

SnTe Thin Films, Optical Constant and Optical Conductivity

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SnTe thin films were prepared and optically investigated in a wide range of photon energy up to 6.2 eV. The optical properties of SnTe thin films were obtained exploiting normal incidence reflectivity and transmissivity measurements. Both n and k were estimated over the investigated spectral range. In addition, the dielectric constant, plasma frequency, optical conductivity, surface and volume energy loss factors were also determined. The type of optical transition, energy gap. The type of optical transition, the absorption coefficient, relaxation time, oscillation energy and the dispersion energy of SnTe thin film were obtained as well. A single oscillation model has been applied to the obtained results.

$P2_3$

Transient Creep Characteristics Near the Transformation Temperatures of Al-5wt%Zn and Al-i 5wt%Zn Alloys

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**Department of Physics, Faculty of Science, Ain Shams University, Cairo, Egypt*

Al-Zn alloys are stronger than most aluminum based alloys. They provide materials which combine the high wear resistance, heat resistance and strength with the castability needed for many industrial applications. Constant-stress creep tests were conducted for Al-5wt%Zn and Al-15wt%Zn alloys under various stresses ranging from 114.6 to 129.8 MPa for Al-5wt%Zn alloy and from 129.8 to 150 MPa for the second alloy. The transient creep parameters n and β were determined for each alloy in the temperature range around their transformation temperatures. The results for both alloys revealed two different transient deformation regions around their transition points which existed at 393 and 473 K for the two alloys, respectively. The temperature dependence for each of the transient creep parameters n and β attained peak values at the transition points for all the applied stresses. The transient creep was activated with (31.5 ± 0.5) and (29.9 ± 0.4) kJ/mol in the low deformation regions for the two alloys of 5wt%Zn and 15wt%Zn, respectively. These values characterize a dislocation mechanism involving grain sliding or grain migration. The best fitting equation, obtained by the least squares method of the relation between the steady state creep strain rate $\dot{\varepsilon}_{st}$ and the transient creep parameter β, was used to correlate the transient and steady state creep stages for each alloy.

$P2_4$

Photomodulation of the Coupled Plasmon-LO Phonon of GaAs Surfacaes

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Photomodulation of the coupled LO phonon plasmon modes has been employed to determine the change in both the surface charge density and the depletion electric field as a function of photomodulation beam (PMB) intensity. The samples are two highly doped (001) n-type GaAs. The total surface charge density has been obtained as a function of the photomodulating intensity using the dependence of the unscreened LO phonon on the depletion width. We are able to separate the impact of the PMB, on the surface electric field from that on the depletion width, which allows a separate determination of the change in the depletion electric field that reaches to ~ 73% of its original value at the highest intensity used for PMB.

$P2_5$

Nano-Composite Transparent Heat Mirror

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Nanocomposite transparent thermal insulation multilayer of the type Dielectric/Nobel Metal/Dielectric on glass were investigated theoretically and experimentally. Sol-Gel derived TiO_2 films were used as dielectric layer and sputtered silver films were used as metal layer. The optical properties of TiO_2 films prepared by spin and dip coating process were investigated. TiO_2/Ag and TiO_2/Ag/TiO_2 multilayer on glass were prepared by combination of dip coating and sputtering processes. The three-layer structure shows a good performance as transparent heat mirror (THM) where the transmittance in the visible range approaches 70% , while it is less than 10% in the near infrared region.

$P2_6$

Precipitation Kinetics in Ag-2wt. % Cu and Ag-2wt. % Cu-0.5wt. In Alloys During Transformation

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The effect of quenching rate on the stress-strain characteristics of Ag-2wt. % Cu and Ag-2wt. % Cu-0.5wt. % In alloys was investigated in the temperature range from 723K to 923K. The work hardening parameters σ_y, σ_f, and χ, were found to decrease with increasing aging temperature exhibiting maxima at 823K. The activation energies of the fracture mechanisms before and after transformation were found to be 22.1 and 39.4 kJ /mol, respectively, characterizing a dislocations intersection and grain boundary diffusion mechanisms in Ag for quenched and slowly cooled samples. An increase in strength was observed for the alloy containing (In). This was attributed to the tendency of (In) atoms to segregate at grain boundaries, causing grain size refinement

$P2_7$

Positron Annihilation Lifetime Spectroscopy of Substituted Mn- Zn Ferrites at Room Temperature.

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Polycrystalline $Mn_{0.6}Zn_{0.4}Fe_{1.9}R_{0.1}O_4$ (R = La, Nd, Sm, Gd and Dy) system have been investigated by means of positron annihilation lifetime spectroscopy at room temperature. The variation of life time parameters, τ_{av}, I_2 and K with ionic radius, grain size and electrical resistivety for all samples are discussed. The results are discussed in the fram work of two- state model.

$P2_8$

Some Ferroelectric Properties and Activation Energy of $(Pb_{1-X}\ Ca_X)\ TiO_3$ Ceramics

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**Physics Department, Faculty of Science (Qena), South Valley University, Egypt*
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The main aspect of this paper is to reveal the suitable concentration of Ca- content which provides the samples of $(Pb_{1-X}\ Ca_X)TiO_3$ ceramics with optimum ferroelectric properties. The dielectric measurments have been carried out under electric field frequencies equal to 1KHz and 100KHz. The sample with x=15mol % Ca characterizes with higher value of dielectric constant. The values of ε_{max} equal to 8023 and 6192 at corresponding frequencies 1KHz and 100KHz, respectively. The interpretation of the anomalous behavior of dielectric properties for this sample is attributed to increasing the volume of the domain. The relation between Curie temperature T_C and the concentration of Ca- ions was decreased linearly. The experimental value of T_C is in agreement with its calculated value with the help of the binomial distribution function . In this paper, values of Curie Weiss constants (C^- , C^+) Debye's relaxation time and activation energy as function of Ca-content have been determined.

$P2_9$

Optical Absorption of Sodium Boro Vanadate Glass System

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Glass system of composition $x(Na_2B_4O_710H_2O\text{-}(100\text{-}x)V_2O_5)$ where x = 5, 7.5, 10, 12.5, 15 and 20 mol %, and the silver oxide (Ag_2O) is added as weight percentage (0.001) were prepared from the powder form of (Analar-grade). Optical absorption measurements in the spectral range (325-2500 nm) were carried out at room temperature. No sharp absorption edges was observed indicating the non-crystalline nature of the samples. It is observed that the fundamental absorption edge shifts to higher wavelength (low energy) with increasing V_2O_5 content. However the sample containing 10-mol % V_2O_5 exhibit opposite trend. The optical band gap for all compositions ranging between 3.85 eV and 3.9 eV. However sample of 10 V_2O_5 exhibit high value 4.2 eV. The value of E_e shows slight decrease by increase 10 V_2O_5 mol %. The optical absorption spectrum exhibits one band at 27780 cm^{-1} characteristic of VO^{2+} ions in tetragonal symmetry. The band has been assigned as 2B2g —*2BIg transition.

$P2_{10}$

Superconductors of Short Ani50tropic Coherence Length In The Modified Ginzburg - Landau Theory

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It is now well established that the anisotropic high temperature superconductors) AHTS) have a small coherence length □, which is comparable with the interatomic distance *d ;* i.e., □ □ *d* .For this reason, and regardless of the pairing mechanism, the macroscopic Ginzburg-Landau (GL) theory can be applied for these superconductors with careful treatment of the problem of fluctuations of the GL order parameter .In the present study, we consider the GL order parameter in the form □(r)= f(r) exp [iϕ(*r*)] with modified temperature dependence of the GL expansion coefficients of the energy functional (which will be considered as the effective Hamiltonian). A number of fundamental problems of AHTS will be considered in the frame of the proposal modified Ginzburg - Landau (MGL) theory.

$P2_{11}$

Characterization of $CuInSe_2$ Single Crystal

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Single crystals of $CuInSe_2$ were prepared by a vertical Bridgman method. Measurements of electrical conductivity, Hall effect and thermoelectric power were carried out on $CuInSe_2$ samples. From electrical and Hall measurements the electrical conductivity, Hall mobility and hole concentration at 300 K equal to 3.03 Ω^{-1} ohm^{-1} cm^{-1}, 620 $cm^2v^{-1}sec^{-1}$ and $1.5x10^{16}$ cm^{-3} respectively. The energy gap width is found to be equal to 1.04 ev The joining of the electrical and thermoelectric power measurement in the present investigation make it possible to find many physical parameters, where the effective mass of holes m^*_p, and electrons m^*_n were determined at room temperature and found to be $9.3x10^{-28}$ and $1.02x10^{-34}$ kg, respectively. Also, at the same temperature the mobility μ_n was found to be 930 $cm^2/V.s$. The hole and electron diffusion coefficients were found to be 15.5 cm^2/s and 23.25 cm^2/s relaxation times for holes and electrons were calculated and yielded the values $\tau_p=36.04x10^{-11}$ s and $\tau_n=5.93x10^{-17}$s respectively. The diffusion length for holes and electrons were obtained as $L_p= 7.47x10^{-5}$ cm and $L_n= 3.7x10^{-18}$ cm.

P2$_{12}$

GaN Heteroepitaxial Growth on Si Substrate The Advantage and Disadvantage

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Gallium nitride based materials have been attracted much attention in the last few years as promising materials for the optoelectronic devices, light emitting diode, laser diode and I detector. Silicon substrate is thought to be one of the most promising substrate materials for the growth of GaN. it has many advantages, high quality, large size, low cost and availability. Furthermore the heteroepitaxial growth of GaN on Si can combine the optoelectronic properties of GaN with the highly advanced silicon electronic devices. Due to the large lattice mismatch and the difficulty of nucleation of, direct growth of GaN on Si results in polycrystalline GaN film with a poor quality. An intermediate layer should be introduced between the film and substrata. to initiate the growth of single crystal GaN, The buffer layer led to a noticeable improvement in the morphological, quality and properties of the GaN film. The aim of this paper is to review and compare the effect of different buffer layers, AIN, SiC, GaN, Si_3N_4, AlAs, ZnO, BN and HP. on the quality and properties of the grown GaN film on Si substrate.