



"Gh. Asachi" Technical University of Iasi

Faculty of Machine Manufacturing and Industrial Management

Department of Physics

and

Romanian Ministry of Education, Research and Youth

**The 4-th National Conference  
of Applied Physics**

***Book of Abstracts***

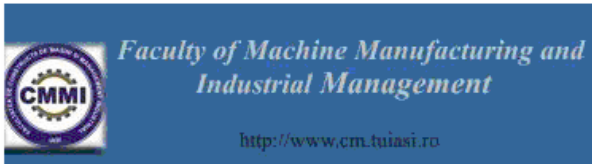
*November, 19<sup>th</sup>-20<sup>th</sup> 2010*

*Iasi, Romania*

**CNFA 2010**

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*“Gh. Asachi” Technical  
University of Iasi*  
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# **The 4-th National Conference of Applied Physics**

**Iasi, Romania,  
November 19 - 20, 2010**

ORGANIZED by:

**The “Gheorghe Asachi” Technical University of Iasi**

**Faculty of Machine Manufacturing and Industrial Management**

**Department of Physics**

under auspices of

**Ministry of Education, Research and Youth**

**The 4-th National Conference of Applied Physics**

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**Iasi, Romania**

**November 19 - 20, 2010**

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## Foreword

CNFA-2010 is the fourth Conference of Applied Physics that is organized by the "Gh. Asachi" Technical University of Iasi, Department of Physics and Romanian Ministry of Education, Research and Youth. The first conference was organized in 2004, the second in 2006 and third in 2008.

More than 150 scientists are participated at these conferences from various countries: France, USA, Ireland, Israel, Finland, Sweden, Russia, Ukraine, Rep. Moldova, and Estonia. From Romania all major universities are represented: Iasi, Bucharest, Cluj, Timisoara, Constanta, Brasov, Sibiu, Craiova, etc.

The aim of the conference is to create a bridge between the physics and its various applications.

Accepted papers presented by their author(s) will be published in a special number of the journal **Bulletin of the Polytechnic Institute of Iasi, Mathematics. Theoretical Mechanics. Physics** (recognized by CNCSIS, as a B+ category journal).

**Sponsors:**



**Partenerul dumneavoastra de incredere**

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**The Conference sections are as follow:**

**1. Theoretical, Mathematical and Computational Physics.**

**2. Physics and Technology of Condensed Matter.**

**3. Optics, Spectroscopy and Plasma Physics.**

**4. Technical Physics and Interdisciplinary.**



**CONFERENCE PROGRAMME:**

**Friday 19 November 2010:**

8 <sup>00</sup> -9 <sup>30</sup> - Registration	Corp T Hall
9 <sup>30</sup> -9 <sup>45</sup> Opening Ceremony	Auditorium T1
9 <sup>45</sup> -11 <sup>15</sup> - Plenary Session (Invited Talks)	Auditorium T1
11 <sup>15</sup> -11 <sup>30</sup> - Coffee Break	Corp T Hall
11 <sup>30</sup> -13 <sup>00</sup> - Plenary Session (Invited Talks)	Auditorium T1
11 <sup>00</sup> -19 <sup>00</sup> - Physics Instruments Exposition	Corp T Hall
13 <sup>00</sup> -14 <sup>30</sup> - Lunch Break	
14 <sup>30</sup> -17 <sup>10</sup> - Oral Session (Section 1)	Auditorium T1
17 <sup>10</sup> -17 <sup>30</sup> - Coffee Break	Corp T Hall
17 <sup>30</sup> -19 <sup>00</sup> - Poster Session (Sections 1 and 2)	Corp T Hall
20 <sup>00</sup> – Festive Dinner	

**Saturday 20 November 2010:**

10 <sup>00</sup> -13 <sup>20</sup> - Oral Session (Section 2, 3 and 4)	Auditorium T1
13 <sup>20</sup> -13 <sup>30</sup> - Coffee Break	Corp T Hall
13 <sup>30</sup> -15 <sup>00</sup> - Poster Session (Sections 3 and 4)	Corp T Hall
15 <sup>00</sup> – Round Table	
10 <sup>00</sup> -15 <sup>00</sup> - Physics Instruments Exposition	Corp T Hall

## The 4-th National Conference of Applied Physics

Iasi, Romania

November 19 - 20, 2010

**Friday 19 November 2010:**

9.30 -9.45- Opening Ceremony

9. 45- 13. 15 - Plenary Session (Invited Talks)

	TITLE OF THE PAPER	AUTHORS	AFFILIATION
<b>I</b> 9.45-10.15	<b>High-Fluence Laser Ablation Plasma Dynamics: Fundamentals and Applications</b>	S. Gurlui <sup>1</sup> , P. Nica <sup>2</sup> , M. Agop <sup>2</sup> , <b><u>C. Focsa</u></b> <sup>3</sup>	<sup>1</sup> Faculty of Physics, "Al. I. Cuza" University of Iasi, Romania <sup>2</sup> Department of Physics, "Gh. Asachi" Technical University of Iasi, Romania <sup>3</sup> Laboratoire de Physique des Lasers, Atomes et Molécules (UMR CNRS 8523), Université Lille 1 Sciences & Technologies, 59655 Villeneuve d'Ascq, France
<b>II</b> 10.15-10.45	<b>Spectral Study of Order-Disorder Equilibrium in Liquid and Solid Solutions</b>	<b>Dana Ortansa Dorohoi</b> <sup>1</sup> , Mihaela Avadanei <sup>2</sup> , Mihaela Maria Dulcescu <sup>1</sup> , Cristina Delia Nechifor <sup>1,3</sup> , Ecaterina Crangeanu <sup>1</sup> , Magdalena Postolache <sup>1</sup> , Alina Rogojanu <sup>1</sup>	<sup>1</sup> University of Alexandru Ioan Cuza, Faculty of Physics, Iasi <sup>2</sup> Petru Poni Institute of Macromolecular Chemistry, Iasi <sup>3</sup> Technical University Gh. Asachi, Iasi
<b>III</b> 10.45-11.15	<b>Microelectromechanical Systems Switches: Dielectric Charging Effects</b>	<b>E. R. Neagu</b> <sup>1,2</sup> , C. J. Dias <sup>1</sup> J. N. Marat-Mendes <sup>1</sup>	<sup>1</sup> Department of Materials Science, (CENIMAT/I3N), Faculty of Science and Technology, The New University of Lisbon, 2829-516 Portugal <sup>2</sup> Department of Physics, Technical University of Iasi, Romania
<b>11.15-11.30</b>	<b>COFFEE BREAK</b>		

**The 4-th National Conference of Applied Physics**

**Iasi, Romania**

**November 19 - 20, 2010**

	<b>TITLE OF THE PAPER</b>	<b>AUTHORS</b>	<b>AFFILIATION</b>
<b>IV</b> 11.30-12.00	<b>Why Are Fractals Necessarily In Physics?</b>	<b>Ioan Gottlieb,</b> Cleopatra Mociutchi,	Department of Physics, Faculty of Physics, "Alexandru Ioan Cuza" University, Blvd. Carol I, nr 11, Iasi 700506, Romania
<b>V</b> 12.00-12.30	<b>A Critical Analysis of Double DeBroglie Solution</b>	<b>V. Păun,</b> <b>M. Agop</b>	<sup>1</sup> Department of Physics I, Faculty of Applied Physics, Politehnica University of Bucharest <sup>2</sup> Department of Physics, "Gh. Asachi" Technical University, Iași, Romania
<b>VI</b> 12.30-13.00	<b>Application of the FORC diagram method in the characterization of the bistable systems</b>	<b>Aurelian Rotaru<sup>1</sup>,</b> Leonard Spinu <sup>2</sup> , Jorge Linares <sup>3</sup> , François Varret <sup>3</sup> , Epiphane Codjovi <sup>3</sup> , Alexandru Stancu <sup>4</sup> , Adrian Graur <sup>1</sup> , Valentin Popa <sup>1</sup> , Yann Garcia <sup>5</sup> .	<sup>1</sup> Faculty of Electrical Engineering and Computer Science, "Stefan cel Mare" University of Suceava, University Street, No 13, 720229, Romania. <sup>2</sup> Advanced Materials Research Institute (AMRI), University of New Orleans, New Orleans, LA 70148, USA. <sup>3</sup> "Groupe d'Etude de la Matière Condensée" (GEMaC), CNRS-UMR 8635, UVSQ, 78035 Versailles Cedex, France. <sup>4</sup> Department of Physics, Faculty of Physics, "Alexandru Ioan Cuza" University, Blvd. Carol I, nr 11, Iasi 700506, Romania <sup>5</sup> Institut de la Matière Condensée et des Nanosciences, Université Catholique de Louvain, Place L. Pasteur 1, 1348 Louvain-la-Neuve, Belgium.

13.00-14<sup>30</sup>- Lunch Break

14.30-17.00- Oral Session (Section 1)

<b>Section 1. Theoretical, Mathematical and Computational Physics</b>			
	<b>Title of the paper</b>	<b>Authors</b>	<b>Affiliation</b>
<b>S1-O1</b> 14.30-14.50	<b>Classical and Quantum Communications in Gridcomputing</b>	<b>M. Dima</b> <sup>1</sup> , D. Aranghel <sup>1</sup> , B. Mitrica <sup>1</sup> , M. Dulea <sup>1</sup> , M. Stoica <sup>2</sup> , M. Udrea <sup>2</sup> , R. Sterian <sup>3</sup> , P. Sterian <sup>3</sup>	<sup>1</sup> National Institute for Nuclear Physics and Engineering, Bucharest, Magurele <sup>2</sup> National Institute for Laser and Plasma Physics, Bucharest-Magurele, Romania <sup>3</sup> Polytechnical University, Bucharest, Romania
<b>S1-O2</b> 14.50-15.10	<b>Quantum Tunnelling of Bosons in Electro-Magnetic Static Fields</b>	Marina-Aura Dariescu, Ciprian Dariescu. <b>Ovidiu Buhucianu</b>	Faculty of Physics, Al. I. Cuza' University, Iasi, Romania
<b>S1-O3</b> 15.10-15.30	<b>On Maximal Velocity in Various Classical and Quantum Set-Ups</b>	<b>Ciprian – Sorin Acatrinei</b>	Horia Hulubei National Institute of Nuclear Physics and Engineering
<b>S1-O4</b> 15.30-15.50	<b>Quantum Phase Transition in an 1D Anharmonic Chain with Applications to Nanophysics</b>	<b>Victor Barsan</b>	Department of Theoretical Physics, IFIN-HH, Magurele-Bucharest
<b>S1-O5</b> 15.50-16.10	<b>Lambert Function and Some Transcendental Equations of Nanomagnetism</b>	<b>Victor Barsan</b>	Department of Theoretical Physics, IFIN-HH, Magurele-Bucharest
<b>S1-O6</b> 16.10-16.30	<b>Mathematic Modeling to Optimize the Obtaining Process of New Xanthine Derivatives</b>	Mihaela Avădanei <sup>1</sup> , <b>Mihaela-Maria Dulcescu</b> <sup>3</sup> , Mihaela Moise <sup>2</sup> , Valeriu Sunel <sup>2</sup> , Lenuța Profire <sup>4</sup> , Dana-Ortansa Dorohoi <sup>1,3</sup>	<sup>1</sup> “Petru Poni” Institute of Macromolecular Chemistry, Iasi, Romania <sup>2</sup> Department of Organic Chemistry, Faculty of Chemistry, Al. I. Cuza University, Iasi, <sup>3</sup> Department of Optics and Spectroscopy, Faculty of Physics, Al. I. Cuza University, Iasi, 11 Carol I Blvd, RO-700506 Romania <sup>4</sup> “Gr.T. Popa” University of Medicine and Pharmacy, Faculty of Pharmacy, Iasi

**The 4-th National Conference of Applied Physics**

Iasi, Romania

November 19 - 20, 2010

<b>Section 1. Theoretical, Mathematical and Computational Physics</b>			
	<b>Title of the paper</b>	<b>Authors</b>	<b>Affiliation</b>
<b>S1-O7</b> <b>16.30-16.50</b>	<b>The Advanced Security Model for Wireless Data Transmissions, Based on Improved RSA Algorithm Combined With RNS in a Convolutional Cryptosystem</b>	<b><u>Mircea Daniel Frunza,</u></b>  Luminita Scripcariu	“Gh.Asachi” Technical Univerisity of Iasi, Faculty of Electronics Telecommunications and Information Technology, IASI, Romania
<b>S1-O8</b> <b>16.50-17.10</b>	<b>Dynamics of Bloch Electrons in Time Dependent Electric Fields: Estimates for Arbitrary Order Inter-Band Transitions.</b>	<b><u>Alexandrina Nenciu</u></b>	Faculty of Applied Sciences, Department of Physics, Politehnica University of Bucharest

**17.10-17.30 Coffee Break**

**17.30-19.00- Poster Session (Sections 1 and 2)**

<b>Section 1. Theoretical, Mathematical and Computational Physics</b>			
	<b>Title of the paper</b>	<b>Authors</b>	<b>Affiliation</b>
<b>S1-P1</b>	<b>Algebraic Computing Programs for Gauge Theories</b>	<b><u>Gheorghe Zet</u></b>	Technical University, Department of Physics, Iasi, Romania
<b>S1-P2</b>	<b>Time Invariance of the Fundamental Physical Constants</b>	<b><u>Mugur-Bogdan Raut</u></b>	“Al. I. Cuza” University of Iasi, Faculty of Physics
<b>S1-P3</b>	<b>Energy-Momentum Localization – a Short History</b>	<b><u>Irina Radinschi</u></b>	Department of Physics, “Gh. Asachi” Technical University,
<b>S1-P4</b>	<b>Efficiency of Using a Virtual Physics Laboratory</b>	I. Radinschi, <b><u>B. Aignatoaiei</u></b>	Department of Physics, “Gh. Asachi” Technical University, Iasi, Romania Faculty of Automatic Control and Computer Science, “Gh. Asachi” Technical University, Iasi, Romania
<b>S1-P5</b>	<b>Computation of the Electromagnetic Field in Wood Heating</b>	<b><u>Palade Paula Alexandra,</u></b>  Vușcan Florin Bogdan	University of Oradea, Faculty of Electrical Engineering and Information Technology, Department of Electrical Engineering, Oradea, Romania,

<b>Section 1. Theoretical, Mathematical and Computational Physics</b>			
	<b>Title of the paper</b>	<b>Authors</b>	<b>Affiliation</b>
<b>S1-P6</b>	<b>Perovskites-Like Magnetic Materials Properties Prediction by Innovative Computational Simulation IT-Based Techniques</b>	<b><u>S. Mohorianu</u><sup>1</sup></b> M.-L. Craus <sup>1,2</sup>	<sup>1</sup> National Institute of Research and Development for Technical Physics, Iasi, Romania, <sup>2</sup> IUCN, Frank Laboratory for Neutron Physics (FLNP)Dubna, Moskovskaia oblasti, Russia
<b>S1-P7</b>	<b>Statistic Modeling and Optimization for the Chlorosulphonation of Acetanilide</b>	<b><u>Rodica Diaconescu</u><sup>1</sup></b> , P. Georgescu <sup>2</sup> , C. Oniscu <sup>3</sup> , Nicoleta Vornicu <sup>4</sup> , Cristina Bibire <sup>4</sup> , Liliana Vornicu <sup>5</sup> , Corina Cernătescu <sup>4</sup> , Anca Mocanu <sup>4</sup>	<sup>1</sup> „Gh.Asachi” Technical University of Iași, Department of Chemical Engineering, <sup>2</sup> „Al.I.Cuza” University of Iași, Department of Mathematics <sup>3</sup> „Gh.Asachi” Technical University of Iași, Department of Organic and Biochemical Engineering <sup>4</sup> Metropolitan center of Research T.A.B.O.R., The Mtropolitanate of Moldavia and Bukovina, Iași <sup>5</sup> „Gh.Asachi” Technical University of Iași, Department of Applied Electronics and Inteligent Systems
<b>S1-P8</b>	<b>Neural Modeling and Simulation for the Chlorosulphonation of Acetanilide Process</b>	<b><u>Rodica Diaconescu</u><sup>1</sup></b> , P. Georgescu <sup>2</sup> , C. Oniscu <sup>3</sup> , Nicoleta Vornicu <sup>4</sup> , Cristina Bibire <sup>4</sup> , Liliana Vornicu <sup>5</sup> , Corina Cernătescu <sup>4</sup> , Anca Mocanu <sup>4</sup>	<sup>1</sup> „Gh.Asachi” Technical University of Iași, Department of Chemical Engineering, email: <sup>2</sup> „Al.I.Cuza” University of Iași, Department of Mathematics <sup>3</sup> „Gh.Asachi” Technical University of Iași, Department of Organic and Biochemical Engineering <sup>4</sup> Metropolitan center of Research T.A.B.O.R., The Mtropolitanate of Moldavia and Bukovina, Iași <sup>5</sup> „Gh.Asachi” Technical University of Iași, Department of Applied Electronics and Inteligent Systems
<b>S1-P9</b>	<b>On The Rotational Flow of a Newtonian Fluid Between Two Circular Cylinders</b>	I. Siddique <sup>1</sup> , A. Mahmood <sup>1</sup> , A. A. Zafar <sup>2</sup>	<sup>1</sup> Department of Mathematics COMSATS Institute of Information Technology, Lahore Pakistan <sup>2</sup> Abdus Salam School of Mathematical Sciences, Lahore, Pakistan
<b>S1-P10</b>	<b>An Analitic Solution for MHD Flow of a Newtonian Fluid in Porous Space</b>	Shahraz Akhter <sup>1</sup> , T. Mahmood <sup>1</sup> , M. Nazar <sup>2</sup> Qamar Sultan <sup>2</sup>	<sup>1</sup> Department of Mathemates, The Islamia University, Bahawalpur, Pakistan <sup>2</sup> Centre for Advanced Studies in Pure and Applied Mathematics, Bahauddin Zakariya University,Multan, Pakistan

<b>Section 1. Theoretical, Mathematical and Computational Physics</b>			
	<b>Title of the paper</b>	<b>Authors</b>	<b>Affiliation</b>
<b>S1-P11</b>	<b>Gravitational Shielding Through an Electromagnetic Field</b>	<b><u>R. Stana</u></b> <sup>1</sup> , B. Constantin <sup>2</sup> , Manuela Gartu <sup>3</sup> , M. Agop <sup>2</sup>	<sup>1</sup> Al.I.Cuza University, Faculty of Physics, Iași, 11A Carol I Blvd., 700506, Romania, <sup>2</sup> Department of Physics“Gh. Asachi” Technical University,Bd. D. Mangeron, no.67, Iasi, 700050, Romania <sup>3</sup> “Vasile Alecsandri” University of Bacau
<b>S1-P12</b>	<b>Gravitational Exotic Effect in Fractal Fluid</b>	<b><u>D. Magop</u></b> <sup>1</sup> , B. Constantin <sup>2</sup> , M. Agop <sup>2</sup>	<sup>1</sup> Al.I.Cuza University, Faculty of Physics, Iași, 11A Carol I Blvd., 700506, Romania, <sup>2</sup> Department of Physics“Gh. Asachi” Technical University,Bd. D. Mangeron, no.67, Iasi, 700050, Romania
<b>S1-P13</b>	<b>Fractal Model to Evaluate Drug Release From Polymeric Matrices</b>	<b><u>Cristina-Delia Nechifor</u></b> <sup>1,2</sup> , Maricel Agop <sup>2</sup>	<sup>1</sup> Al.I.Cuza University, Faculty of Physics, Iași, 11A Carol I Blvd., 700506, Romania, <sup>2</sup> Department of Physics“Gh. Asachi” Technical University,Bd. D. Mangeron, no.67, Iasi, 700050, Romania
<b>S1-P14</b>	<b>The Transition to Chaos in a System of Asymmetric Coupled Three Logistic Maps</b>	<b><u>Viorel Stancu</u></b> , Liviu Badelita	Technical University “Gheorghe Asachi”, Physics Department, Iasi, ROMANIA
<b>S1-P15</b>	<b>On the Transition to Turbulence in a System of Asymmetrically Coupled Chaotic Maps</b>	Viorel Stancu, <b><u>Liviu Bădeliță</u></b>	Technical University “Gheorghe Asachi”, Physics Department, Iasi, ROMANIA
<b>S1-P16</b>	<b>The Electrical Conductance Quantification in Nanostructures: A Theoretical Approach</b>	<b><u>D. Matasaru</u></b> I. Casian-Botez M. Agop	Technical University “Gheorghe Asachi”, Faculty of Electronics, Telecommunication and Information Technology
<b>S1-P17</b>	<b>Modelling of Nanostructures Through Fractal Space-Time Theory. Part II.</b>	<b><u>I. Casian-Botez</u></b> M. Agop	Technical University “Gheorghe Asachi”, Faculty of Electronics, Telecommunication and Information Technology
<b>S1-P18</b>	<b>New Exact Solutions for Motions of Brinkman Type Fluids</b>	<b><u>Corina Fetecău</u></b> , Liliana Bejan Florina Buzescu	Technical University “Gh. Asachi” of Iasi, Romania Department of Theoretical Mechanics

<b>Section 2. Physics and Technology of Condensed Matter</b>			
	<b>Title of the paper</b>	<b>Authors</b>	<b>Affiliation</b>
<b>S2-P1</b>	<b>Conduction Properties of Phosphorus-Modified Polysulfones</b>	<b><u>Luminita-Ioana Buruiana</u></b> , Valentina Elena Musteata, Oana Petreus, Ecaterina Avram, Silvia Ioan	“Petru Poni” Institute of Macromolecular Chemistry
<b>S2-P2</b>	<b>Surface and Interfacial Properties of Cellulose Acetate --Polysulfone Blends</b>	<b><u>Adina Maria Dobos</u></b> , Niculae Olaru, Liliana Olaru, Anca Filimon Silvia Ioan	“Petru Poni” Institute of Macromolecular Chemistry
<b>S2-P3</b>	<b>Dielectric Properties of Some Polysulfones with Quaternary Groups</b>	<b><u>Raluca-Marinica Albu</u></b> , Ecaterina Avram, Valentina Elena Musteata, Mihaela Homocianu Silvia Ioan	“Petru Poni” Institute of Macromolecular Chemistry
<b>S2-P4</b>	<b>Viscoelastic Properties of Some Epiclone-Based Polyimide Blends</b>	<b><u>Simona-Luminta Nica</u></b> , Silvia Ioan, Camelia Hulubei, Andreea Irina Cosutchi	“Petru Poni” Institute of Macromolecular Chemistry
<b>S2-P5</b>	<b>Nanostructure of Ion Channel</b>	<b><u>Mariana Latu</u></b>	Technical University, Department of Physics
<b>S2-P6</b>	<b>Dichroic Ratio Aand Order Degree of Zwitterionic Molecules in Poly Vinyl Alcohol Stretched Foils</b>	<b><u>Laura Obreja Ursu</u></b> <sup>1</sup> , Magdalena Postolache <sup>2</sup> , Mihai Postolache <sup>3</sup> , Dana Ortansa Dorohoi <sup>1,2</sup>	<sup>1</sup> “Petru Poni” Institute of Macromolecular Chemistry, Iasi <sup>2</sup> “Alexandru Ioan. Cuza” University, Faculty of Physics, Iași <sup>3</sup> “Gh. Asachi” Technical University, Faculty of Automatic Control and Computer Science, Iași
<b>S2-P7</b>	<b>Physical Properties of PVA Films with Sulfathiazole</b>	<b><u>Ecaterina Angheluta</u></b> <sup>1</sup> , Iuliana Stoica <sup>2</sup> , Liliana – Mihaela Ivan <sup>1</sup> , Dana-Ortansa Dorohoi <sup>1</sup>	<sup>1</sup> Faculty of Physics, Alexandru Ioan Cuza University of Iasi, Iasi, Romania, 700506 <sup>2</sup> Petru Poni Institute of Macromolecular Chemistry of the Romanian Academy, Iasi, Romania



<b>Section 2. Physics and Technology of Condensed Matter.</b>			
	<b>Title of the paper</b>	<b>Authors</b>	<b>Affiliation</b>
<b>S2-P8</b>	<b>Spectroscopic FT-IR Study of SiO<sub>2</sub>-CaO-P<sub>2</sub>O<sub>5</sub> Xerogels</b>	<b><u>F. Talos</u>,</b> S. Simon	Babes-Bolyai University, Faculty of Physics Interdisciplinary Research Institute on Bio-Nano-Sciences, Cluj-Napoca, Romania
<b>S2-P9</b>	<b>Preliminary Investigations of Fe<sub>3</sub>O<sub>4</sub>-Ferrofluids at Different Temperatures by Means of Magnetic Measurements</b>	<b><u>C. Stan</u><sup>1</sup>,</b> C. P. Cristescu <sup>1</sup> , M. Balasoiu <sup>2,3</sup> , T.N.Perov <sup>4</sup> , V.N. Duginov <sup>3</sup> , T.N. Mamedov <sup>3</sup>	<sup>1</sup> Department of Physics I, Faculty of Applied Physics, Politehnica University of Bucharest, Romania <sup>2</sup> Joint Institute for Nuclear Research, Dubna, Russia <sup>3</sup> Horia Hulubei National Institute of Physics and Engineering, Bucharest, Romania <sup>4</sup> Physics Department, Moscow State University, Moscow, Russia
<b>S2-P10</b>	<b>Magnetogrulometric Characteristics and Fractal Type Dispersion Within an Aqueous Ferrofluid Based on Magnetite Stabilized with Tetramethyl Amonium Hydroxide</b>	<b><u>Cristina Stan</u><sup>1</sup>,</b> Dorina Emilia Creanga <sup>2</sup> , Constantin P. Cristescu <sup>1</sup> , Mihaela Racuciu <sup>3</sup>	<sup>1</sup> Department of Physics I, Faculty of Applied Physics, Politehnica University of Bucharest, Romania <sup>2</sup> Faculty of Physics, Alexandru Ioan Cuza University of Iasi, Romania, <sup>3</sup> Faculty of Science, "Lucian Blaga University", Sibiu, Romania
<b>S2-P11</b>	<b>XPS Investigation of the Atomic Environment in Binary Boron-Bismuthate Glasses</b>	<b><u>B. Oprea</u>,</b> T. Radu, S. Simon	Babes-Bolyai University, Faculty of Physics & Institute of Interdisciplinary Research in Bio-Nano-Sciences, Cluj-Napoca, Romania
<b>S2-P12</b>	<b>Microstructure Studies of Milled Hard and Soft Magnetic Phases for Exchange Coupled Nanocomposites</b>	<b><u>S. Gutoiu</u><sup>1</sup>,</b> A. Trifu <sup>1</sup> , E. Dorolti <sup>1</sup> , O. Isnard <sup>2</sup> , M. Valeanu <sup>3</sup> , F. Popa <sup>4</sup> , I. Chicinas <sup>4</sup> , V. Pop <sup>1</sup>	<sup>1</sup> Faculty of Physics, Babes-Bolyai University, 400084 Cluj-Napoca, Romania <sup>2</sup> Institut Néel, CNRS, Joseph Fourier University, Grenoble, Cédex 9, France <sup>3</sup> National Institute for Material Physics, Magurele, Bucharest, Romania <sup>4</sup> Materials Sciences and Technology Dept., Technical University of Cluj-Napoca, Romania

<b>Section 2. Physics and Technology of Condensed Matter</b>			
	<b>Title of the paper</b>	<b>Authors</b>	<b>Affiliation</b>
<b>S2-P13</b>	<b>Synthesis and Characterisation of Zinc Containing Phosphosilicate Bioglasses</b>	<b><u>R. Veres</u></b> <sup>1,2</sup> , C. Ciuce <sup>2</sup> , V. Simon <sup>1</sup>	<sup>1</sup> Babeş-Bolyai University, Faculty of Physics & Institute of Interdisciplinary Research in Bio-Nano-Sciences, 400084 Cluj-Napoca, Romania <sup>2</sup> Iuliu Hatieganu University of Medicine and Pharmacy, Faculty of Medicine, 400012 Cluj-Napoca, Romania
<b>S2-P14</b>	<b>TiO<sub>2</sub> Thin Films for Photoelectrocatalysis Applications</b>	Teodora Craus, Iuliana Caraman, Marius Stamate, Iuliana Lazar, <b><u>Gabriel Lazar</u></b>	“Vasile Alecsandri” University of Bacau
<b>S2-P15</b>	<b>AFM Studies of DC Magnetron Sputtered TiO<sub>2</sub> Films</b>	<b><u>Marius Stamate</u></b> , Iuliana Lazar, Iuliana Caraman, Gabriel Lazar	“Vasile Alecsandri” University of Bacau
<b>S2-P16</b>	<b>Salicylic Acid Release from Dissolvable Polymeric Blends</b>	<b><u>Cristina-Delia Nechifor</u></b> <sup>1,2</sup> , Marian Luţcanu <sup>2</sup>	<sup>1</sup> “Al.I.Cuza” University, Faculty of Physics, Iasi, Romania <sup>2</sup> The “Gheorghe Asachi” Technical University, Department of Physics, Iaşi, Romania
<b>S2-P17</b>	<b>New Methods of Designing Nanomaterials by Means of a DNA Pseudo-Structure Found in High Temperature Superconductors</b>	<b><u>C. Gh. Buzea</u></b> <sup>1</sup> , M. Agop <sup>2</sup> , D. Magop <sup>3</sup> , R. Stana <sup>3</sup>	<sup>1</sup> National Institute of Research and Development for Technical Physics, D. Mangeron 47, Iasi <sup>2</sup> Technical “Gh Asachi” University, Physics Dept., D. Mangeron 53A, Iasi <sup>3</sup> Faculty of Physics, University “Al. I. Cuza” 11 Carol I Blvd., Iasi
<b>S2-P18</b>	<b>Ethanol Sensing Using Zinc Oxide Thin Films</b>	T. Coman <sup>1</sup> , V. Nica <sup>1</sup> , M. Dobromir <sup>1</sup> , C. Parghie <sup>2</sup> , N. Iftimie <sup>3</sup> , <b><u>C. Baban</u></b> <sup>1</sup>	<sup>1</sup> Faculty of Physics, “Al. I. Cuza” University, Blvd. Carol I, 11, 700506 Iasi, Romania <sup>2</sup> Stefan cel Mare University, Suceava <sup>3</sup> NIRD for Technical Physics, Iasi, Romania
<b>S2-P19</b>	<b>The Study of Magnetite Stabilized by Oleate Ion in Two Different Polarity Fluids</b>	<b><u>Manuela Ursache</u></b> <sup>1</sup> , Ecaterina Focanici <sup>1</sup> , Dorina Creanga <sup>1</sup> , Ovidiu Caltun <sup>1</sup> , Cristina Stan <sup>2</sup>	<sup>1</sup> Al.I.Cuza University, Faculty of Physics, Iaşi, Romania, <sup>2</sup> Politehnica University Bucharest, Romania

## The 4-th National Conference of Applied Physics

Iasi, Romania

November 19 - 20, 2010

<b>Section 2. Physics and Technology of Condensed Matter</b>			
	<b>Title of the paper</b>	<b>Authors</b>	<b>Affiliation</b>
<b>S2-P20</b>	<b>On Some Quantum Tunneling Effects at Some Photoactive Structures with „Charge Transfer”Used as New (Bio)sensors</b>	<b><u>Magda Gherghel</u></b>	Technical “Gh Asachi” University, Physics Dept., D. Mangeron 53A, Iasi-700050
<b>S2-P21</b>	<b>PVA Polarization Filters; Obtaining and Characterization</b>	<b><u>Ecaterina Angheluta</u>, Dana Ortansa Dorohoi</b>	Al.I.Cuza University, Faculty of Physics, Iași, Romania,

### Saturday, 20 November 2010

10<sup>00</sup>-14<sup>00</sup> - Oral Session (Section 1, 2 and 3)

<b>Section 2. Physics and Technology of Condensed Matter.</b>			
	<b>Title of the paper</b>	<b>Authors</b>	<b>Affiliation</b>
<b>S2-O1</b> 10.00-10.20	<b>Effect of Rubbing Material Texture on Polyimide Films Morphology</b>	<b><u>Andreea Irina Cosutchi</u>, Camelia Hulubei, Silvia Ioan, Iuliana Stoica</b>	“Petru Poni” Institute of Macromolecular Chemistry
<b>S2-O2</b> 10.20-10.40	<b>The Hartree-Fock Equations Applied to Impurity Systems</b>	<b><u>Mitrici Stanca</u><sup>1</sup> Vasile Chis<sup>2</sup>, Mircea Crisan<sup>1</sup></b>	<sup>1</sup> University „Babes-Bolyai”, Faculty of Physics, Theoretical and Computational Physics, Cluj-Napoca, ROMANIA <sup>2</sup> University „Babes-Bolyai”, Faculty of Physics, Biomedical Physics, Kogalniceanu 1, Cluj-Napoca, ROMANIA
<b>S2-O3</b> 10.40-11.00	<b>FTIR Spectra Particularities for Antique Pottery</b>	<b><u>Gabriel Lazar</u>, Iuliana Caraman, Iuliana Lazar, Marius Stamate</b>	“Vasile Alecsandri” University of Bacau
<b>S2-O4</b> 11.00-11.20	<b>Comparative Study on Two Magnetic Fluids – Based on CoFe<sub>2</sub>O<sub>4</sub> and ZnFe<sub>2</sub>O<sub>4</sub> Nanoparticles, Prepared by Co-Precipitation Method</b>	<b>Ecaterina Focanici<sup>1</sup>, Manuela Ursache<sup>1</sup>, Valentin Nica<sup>1</sup>, <u>Dorina Creanga</u><sup>1</sup>, Ovidiu Caltun<sup>1</sup> Cristina Stan<sup>2</sup></b>	<sup>1</sup> “Al.I.Cuza” University of Iasi, Romania, Faculty of Physics, <sup>2</sup> Politehnica University Bucharest
<b>S2-O5</b> 11.20-11.40	<b>Adaptive Transmission Power in Body Area Networks</b>	<b><u>L. Scripcariu</u>, M.D. Frunză</b>	Technical University “Gheorghe Asachi” from Iași, Romania
<b>S2-O6</b> 11.40-12.00	<b>Electromagnetic Parameters Determination for the 5CB and 8CB Liquid Crystals used for Novel Tunable Metamaterials</b>	<b><u>D. Ionescu</u><sup>1</sup>, I. B. Ciobanu<sup>2</sup></b>	“Gh. Asachi” Technical University of Iasi, <sup>1</sup> Department of Telecommunication, <sup>2</sup> Department of Physics

## The 4-th National Conference of Applied Physics

Iasi, Romania

November 19 - 20, 2010

### Section 3. Optics, Spectroscopy and Plasma Physics.

	Title of the paper	Authors	Affiliation
<b>S3-O1</b> 12.00-12.20	<b>Optical and Mechanical Properties of PET Films After Physical And Chemical Modifications''''</b>	<b><u>Magdalena Aflori</u></b> , Mioara Drobota, Daniela Ionita	"Petru Poni" Institute of Macromolecular Chemistry
<b>S3-O2</b> 12.20-12.40	<b>Multi-Peak Structure of the Ion Current in Laser Produced Plasma</b>	<b><u>P. Nica</u></b> <sup>1,2</sup> , M. Agop <sup>1</sup> , S. Miyamoto <sup>2</sup> , S. Amano <sup>2</sup> , A. Nagano <sup>2</sup> , T. Inoue <sup>2</sup> , E. Poll <sup>3</sup>	<sup>1</sup> Department of Physics, Technical "Gh. Asachi" University, Iasi, Romania <sup>2</sup> Laboratory of Advanced Science and Technology for Industry, University of Hyogo, Japan <sup>3</sup> Faculty of Physics, "Al. I. Cuza" University, Iasi, Romania
<b>S3-O3</b> 12.40-13.00	<b>Langmuir Probe Investigations of Transient Plasma Plumes Generated by Ultrafast Laser Ablation of Various Metallic Targets</b>	<b><u>Mariana Osiac</u></b> <sup>1</sup> , Gloria Oana Pompilian <sup>2</sup> , Silviu Gurliu <sup>3</sup> Cristian Focsa <sup>2</sup>	<sup>1</sup> Faculty of Physics, University of Craiova, Romania <sup>2</sup> Laboratoire de Physique des Lasers, Atomes et Molécules (UMR CNRS 8523), Université Lille 1 Sciences & Technologies, 59655 Villeneuve d'Ascq, France <sup>3</sup> Faculty of Physics, "Al. I. Cuza" University of Iasi, Romania

### Section 4. Technical Physics and Interdisciplinary.

	Title of the paper	Authors	Affiliation
<b>S4-O1</b> 13.00-13.20	<b>Surface Properties of Excimer Laser Treated Poly(ethylene terephthalate) Films at 248 nm and 308 nm</b>	<b><u>Cristian Ursu</u></b> , Mioara Drobota, Irina Bordianu, Mihaela Adriana Olaru Bogdan Simionescu	Institute of Macromolecular Chemistry Petru Poni, Str. Gr Ghica Voda, no 41 A, Iasi 711321, Romania

13.20-13.30- Coffee Break

13.30-15.00- Poster Session (Sections 3 and 4)

<b>Section 3. Optics, Spectroscopy and Plasma Physics.</b>			
	<b>Title of the paper</b>	<b>Authors</b>	<b>Affiliation</b>
<b>S3-P1</b>	<b>Considerations on Some Compounds of The Complex B Vitamins</b>	Andreea – Celia Benchea <sup>1</sup> , Daniela Vasilica Andries <sup>2</sup> , <u>Liliana – Mihaela Ivan<sup>1</sup></u> , Dana Ortansa Dorohoi <sup>1</sup>	<sup>1</sup> Faculty of Physics, “Alexandru Ioan Cuza University” of Iasi, Romania <sup>2</sup> Faculty of Electronics, Telecommunications and Information Technology, “Gh. Asachi” Technical University of Iasi, Romania
<b>S3-P2</b>	<b>Electro-Optic Parameters of Some Carbanion Monosubstituted Cycloimmonium Ylids</b>	<u>Roxana Stanculescu</u> , Dana Ortansa Dorohoi	Alexandru Ioan Cuza University, Faculty of Physics of Iasi, Romania
<b>S3-P3</b>	<b>New Method to Determine of the Main Refractive Indices of PET Foils</b>	Mioara Drobotă <sup>1</sup> , <u>Carmen Felicia Dascalu<sup>2</sup></u> , Magda Aflori <sup>1</sup> , Dana Ortansa Dorohoi <sup>1,2</sup>	<sup>1</sup> ”Petru Poni” Institute of Macromolecular Chemistr, Iasi, <sup>2</sup> ”Alexandru Ioan. Cuza” University, Faculty of Physics, Iași
<b>S3-P4</b>	<b>Refractive Indices of Oriental Carpathians Quartz. Applications.</b>	<u>Beatrice Carmen Zelinski<sup>1</sup></u> , Carmen Iustain <sup>2</sup> , Carmen-Felicia Dascalu <sup>1</sup> , Dana-Ortansa Dorohoi <sup>1</sup>	<sup>1</sup> ”Al. I. Cuza” University, Faculty of Physics, Iasi, Romania. <sup>2</sup> Physics of Pharmaceuticals" laboratory of Chemagis, API's division of Perrigo Company, Israel
<b>S3-P5</b>	<b>Electro-Optical Parameters of Mica Crystals</b>	<u>Carmen-Felicia Dascalu<sup>1</sup></u> , Beatrice Carmen Zelinski <sup>1</sup> , Carmen Iustain <sup>2</sup> , Dana-Ortansa Dorohoi <sup>1</sup>	<sup>1</sup> ”Al. I. Cuza” University, Faculty of Physics, Iasi, Romania. <sup>2</sup> Physics of Pharmaceuticals" laboratory of Chemagis, API's division of Perrigo Company, Israel
<b>S3-P6</b>	<b>Electrical Probes Investigation of a Plasma Fireball Dynamics</b>	<u>Oana Niculescu<sup>1</sup></u> , Adrian Niculescu <sup>2</sup>	<sup>1</sup> “Al. I. Cuza” University, Faculty of Physics, Iasi, Romania <sup>2</sup> “Grigore Antipa” National Institute for Marine Research and Development, Department of Oceanography Marine and Costal Engineering, , Constanta, Romaia
<b>S3-P7</b>	<b>A Solvatochromic Method for Determining the Electric Polarizabilities in the Excited Electronic States of Molecules</b>	<u>Luminita Stroia</u> , Crina-Marcela Rusu, Dana Ortansa Dorohoi	”Alexandru Ioan. Cuza” University, Faculty of Physics, Iași, Romania

<b>Section 3. Optics, Spectroscopy and Plasma Physics</b>			
	<b>Title of the paper</b>	<b>Authors</b>	<b>Affiliation</b>
<b>S3-P8</b>	<b>A Study of the Stretching Effect on the Anisotropy of Polymer Foils</b>	Mihai Postolache <sup>1</sup> Laura Obreja Ursu <sup>2</sup> , <u>Magdalena Postolache</u> <sup>3</sup> , Dana Ortansa Dorohoi <sup>2,3</sup>	<sup>1</sup> “Gh. Asachi” Technical University, Faculty of Automatic Control and Computer Science, Iași, Romania <sup>2</sup> “Petru Poni” Institute of Macromolecular Chemistry, Iași, Romania <sup>3</sup> “Alexandru Ioan. Cuza” University, Faculty of Physics, Iași, Romania
<b>S3-P9</b>	<b>Consolidation of Nanocrystalline Supermalloy Mechanically Alloyed Powders by Spark Plasma Sintering</b>	<u>Ionel Chicinas</u> , Ioan Ciascai, Bogdan Neamțu, Horia Chiriac <sup>2</sup> , Florin Popa <sup>1</sup> , M. Lostun <sup>2</sup> , Olivier Isnard, Viorel Pop	<sup>1</sup> Materials Science and Technology Dept., Technical University of Cluj-Napoca, Romania <sup>2</sup> National Institute of R&D for Technical Physics, Iasi, Romania <sup>3</sup> Institut Néel, CNRS, BP166, University J. Fourier, 38042 Grenoble, Cédex 9, France <sup>4</sup> Faculty of Physics, Babes-Bolyai University, 400084 Cluj-Napoca, Romania
<b>S3-P10</b>	<b>Spectroscopic Study of Gamma Irradiated High Density Polyethylene</b>	<u>M. Pop</u> , L.Udrescu, O.Ponta, M.Todica, L. Daraban.	Universitatea Babes Bolyai Cluj Napoca
<b>S3-P11</b>	<b>Spectrophotometric Assay of Visible Absorption Band of Triphenylformazan Derivatives in Binary Solutions</b>	<u>Claudia Nădejde</u> , Dorina-Emilia Creangă, Dana-Ortansa Dorohoi	Al.I. Cuza University, Faculty of Physics, Iasi, Romania
<b>S3-P12</b>	<b>Infrared And Raman Platform For Non-Contact Characterization of Art Objects At IFIN-HH</b>	<u>Mihaela Manea</u> <sup>1</sup> , Marian Virgolici <sup>1</sup> , Valentin Moise <sup>1</sup> , Ioana Stanculescu <sup>1,2</sup> , Daniel Negut <sup>1</sup> , Mihalis Cutrubinis <sup>1</sup> , Rodica Georgescu <sup>1</sup> , Rares Suvaila <sup>1</sup> , Corneliu Ponta <sup>1</sup>	<sup>1</sup> IRASM Radiation Processing Centre, Horia Hulubei National Institute of Physics and Nuclear Engineering, Magurele, Ilfov, Romania <sup>2</sup> Department of Physical Chemistry, Faculty of Chemistry, University of Bucharest, Romania

The 4-th National Conference of Applied Physics

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<b>Section 3. Optics, Spectroscopy and Plasma Physics</b>			
	<b>Title of the paper</b>	<b>Authors</b>	<b>Affiliation</b>
<b>S3-P13</b>	<b>Non-Destructive Study on Polychrome Wood Cultural Heritage by X-Ray Fluorescence Spectroscopy</b>	Corneliu Catalin Ponta <sup>1</sup> , <u><b>Maria Geba</b></u> <sup>2</sup> , Ana Maria Vlad <sup>2</sup> , Daniela Salajan <sup>2</sup>	<sup>1</sup> IRASM, "Horia Hulubei" National Institute of Physics and Nuclear Engineering, Bucharest, Romania <sup>2</sup> "Moldova" National Complex of Museums, Research and Restoration Conservation Centre Iasi, Romania
<b>S3-P14</b>	<b>Theoretical Investigation on Some Physico-Chemical Properties of Two Antibacterial Drugs</b>	<u><b>Claudia Nădejde</b></u> , Dorina Emilia Creangă, Dana-Ortansa Dorohoi	Al.I. Cuza University, Faculty of Physics, 11A Carol I Bd., 700506, Iași, Romania
<b>S3-P15</b>	<b>Human Photoreceptors Orientation</b>	<u><b>Octavian Ciobanu</b></u> <sup>2</sup> , Gabriela Ciobanu <sup>1</sup>	<sup>1</sup> "Grigore T. Popa" Medicine and Pharmacy University of Iasi, Faculty of Medical Bioengineering, University Street, No. 16, 700115, Iasi, Romania; <sup>2</sup> "Gheorghe Asachi" Technical University of Iasi, Faculty of Chemical Engineering and Environmental Protection, Bvd. D. Mangeron, No. 71, 700050, Iasi, Romania;
<b>S3-P16</b>	<b>The Scanning Electron Microscopy (SEM) Investigations of Hydroxyapatite Coatings</b>	<u><b>Gabriela Ciobanu</b></u> <sup>1</sup> , Octavian Ciobanu <sup>2</sup>	<sup>1</sup> "Gheorghe Asachi" Technical University of Iasi, Faculty of Chemical Engineering and Environmental Protection, Bvd. D. Mangeron, No. 71, 700050, Iasi, Romania; <sup>2</sup> "Grigore T. Popa" Medicine and Pharmacy University of Iasi, Faculty of Medical Bioengineering, University Street, No. 16, 700115, Iasi, Romania;

<b>Section 4. Technical Physics and Interdisciplinary.</b>			
	<b>Title of the paper</b>	<b>Authors</b>	<b>Affiliation</b>
<b>S4-P1</b>	<b>Application of Unifac Group Contribution Model to Predict the Enthalpy Data for Toluene with Several Alkyl Ethanoates Binary Mixtures at 298,15 K</b>	<b><u>Georgiana Bolat</u></b> <sup>1</sup> , D. Sutiman <sup>1</sup> , J. Ortega Saavedra <sup>2</sup>	<sup>1</sup> Gheorghe Asachi” Technical University of Iasi, Faculty of Chemical Engineering and Environmental Protection, Department of Chemical Engineering <sup>2</sup> University of Las Palmas de Gran Canaria, Spain
<b>S4-P2</b>	<b>A Prototype Mini High Gradient Magnetic Separator Device For Blood Detoxification. In Vitro Characterization.</b>	<b><u>V. Bădescu</u></b> <sup>1</sup> , Laura Elena Udrea <sup>1</sup> , Rodica Bădescu <sup>2</sup> , Gabriela Apreotesei <sup>2</sup>	<sup>1</sup> National Institute of Research and Development for Technical Physics, , Iași, Romania <sup>2</sup> Department of Physics, “Gh. Asachi” Technical University, Iași, Romania
<b>S4-P3</b>	<b><i>In Vitro</i> Utilization of Superparamagnetic Nanoparticles in Hemodialysis Therapy.</b>	V. Bădescu <sup>1</sup> , Laura Elena Udrea <sup>1</sup> , <b><u>Rodica Bădescu</u></b> <sup>2</sup> , Gabriela Apreotesei <sup>2</sup>	<sup>1</sup> National Institute of Research and Development for Technical Physics, Iași, Romania <sup>2</sup> Department of Physics, “Gh. Asachi” Technical University, Iași, Romania
<b>S4-P4</b>	<b>The Influence of the Sputtering Power Density on the Microstructure and Magnetic Properties of CoFeSib Thin Films</b>	<b><u>M. Grigoras</u></b> , O.G. Dragos, N. Lupu, H. Chiriac	National Institute of Research and Development for Technical Physics, Iasi, Romania
<b>S4-P5</b>	<b>Applications of Magnetic Nanoparticles in Hyperthermia Treatments</b>	<b><u>Gabriela Apreotesei</u></b> <sup>1</sup> , Rodica Bădescu <sup>1</sup> , V. Bădescu <sup>2</sup> , Laura Elena Udrea <sup>2</sup>	<sup>1</sup> Department of Physics, “Gh. Asachi” Technical University , Iași , Romania <sup>2</sup> National Institute of Research and Development for Technical Physics,Iași, Romania
<b>S4-P6</b>	<b>Squid Applications in Biomagnetism</b>	Octavian Baltag, <b><u>Doina Costandache</u></b> , Anca Iftemie, Miuta Rau, Silvana Ojica, Ion Rau	“Gr.T. Popa” University of Medicine and Pharmacy, Iasi, Romania
<b>S4-P7</b>	<b>Study for the Location of a Bioelectromagnetic Research Laboratory</b>	<b><u>Rău Miuta</u></b> <sup>1,2</sup> , Baltag Octavian <sup>1</sup> , Rău Ion <sup>1</sup>	<sup>1</sup> „ Gh Asachi” Technical University of Iasi, Faculty of Electrical Engineering <sup>2</sup> „ Gr.T.Popa” University of Medecine and Pharmacy, Iasi, Faculty of Medical Bioengineering



<b>Section 4. Technical Physics and Interdisciplinary</b>			
	<b>Title of the paper</b>	<b>Authors</b>	<b>Affiliation</b>
<b>S4-P8</b>	<b>Experimental Investigations Focused on Plant Organisms Response to the Action of Ionizing Radiations</b>	<b><u>Ramona Focea</u></b> , Dorina E. Creanga	Faculty of Physics, „Al.I.Cuza” University, Iasi, Romania
<b>S4-P9</b>	<b>Wood Drying in Electromagnetic Field</b>	<b><u>Palade Paula Alexandra</u></b> , Vicaș Simina Maria	University of Oradea, Faculty of Electrical Engineering and Information Technology, Department of Electrical Engineering, Oradea, Romania,
<b>S4-P10</b>	<b>Experimental Simulation of the Impact of Electromagnetic Pollution and Magnetic Contamination on Plants</b>	Corina Astefanoaei, Manuela Ursache, Dorina Creanga, Florin Tufescu, <b><u>Ramona Focea</u></b>	Al .I .Cuza University, Faculty of Physics, Iași, 11A Carol I Blvd., 700506, Romania
<b>S4-P11</b>	<b>The Effect of Microwaves Exposure Magnetite Nanoparticles Administration on Sunflower Young Seedlings</b>	Corina Astefanoaei, Manuela Ursache, <b><u>Dorina Creanga</u></b> , Florin Tufescu, Ramona Focea	”Al.I.Cuza” University of Iasi, Romania, Faculty of Physics,
<b>S4-P12</b>	<b>Electrochemical Impedance Spectroscopy Investigation of Plasma Nitrided Austenitic Stainless Steel</b>	Iacob Strugaru <sup>1</sup> , C. Munteanu <sup>1</sup> , S. Tarnauceanu <sup>1</sup> <b><u>D. Mareci</u></b> <sup>2</sup>	<sup>1</sup> “Gheorghe Asachi” Technical University of Iasi, Faculty of Mechanical Engineering, 61-63 Bd. D. Mangeron, 700050, Iasi, Romania <sup>2</sup> “Gheorghe Asachi” Technical University of Iasi, Faculty of Chemical Engineering and Environmental Protection, 73 Bd. D. Mangeron, 700050, Iasi, Romania
<b>S4-P13</b>	<b>Microwaves Thermography vs. Infrared Thermography</b>	<b><u>Ojica Silvana</u></b> <sup>1</sup> , Baltag Octavian <sup>2</sup> , Costandache Doina <sup>2</sup> , Iftemie Anca <sup>2</sup> , Rau Miuta <sup>2,3</sup>	<sup>1</sup> Al. I. Cuza” University, Faculty of Physics <sup>2</sup> „Gr.T.Popa” University of Medecine and Pharmacy, Iasi, Faculty of Medical Bioengineering <sup>3</sup> „ Gh Asachi” Technical University of Iasi, Faculty of Electrical Engineering

<b>S4-P14</b>	<b>FTIR Studies Regarding the Model Membranes Fluidity</b>	Feride Severcan <sup>1</sup> , Filiz Kokmaz <sup>1</sup> , Catalin Agheorghiesei <sup>2</sup> , <b><u>Dana Ortansa</u></b> <b><u>Dorohoi</u></b> <sup>2</sup>	<sup>1</sup> Faculty of Biology, Middle East Technical University of Ankara, 06531 Turkey Faculty of Physics, Alexandru Ioan Cuza University of Iasi, Romania
<b>S4-P15</b>	<b>Simulational Study of the YIG Films in the Frequency Range of 18 - 27 Ghz</b>	D. Ionescu <sup>1</sup> , I. B. Ciobanu <sup>2</sup>	"Gh. Asachi" Technical University of Iasi, <sup>1</sup> Department of Telecommunication <sup>2</sup> Department of Physics

## INVITED TALKS

### I. HIGH-FLUENCE LASER ABLATION PLASMA DYNAMICS:

#### FUNDAMENTALS AND APPLICATIONS

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#### Abstract:

Studying the dynamics of pulsed laser generated plasma plumes presents fundamental interest, as getting better understanding of the complex laser-matter interaction and subsequent elementary processes taking place in the transient expansion, but is also of significant importance for application fields like analytical or materials sciences. Our group has developed for several years combined optical/electrical investigation methods based on ICCD fast imaging, space- and time-resolved optical emission spectroscopy, or Langmuir probe techniques. This combined approach has been applied to the study of various objects, from simple model targets (as Aluminium or Copper) to more complex, technologically interesting materials (as ceramics, chalcogenide glasses, or ferromagnetics). The fundamental data sets collected have served as inputs of a fractal hydrodynamic model, developed in collaboration with the Technical University of Iasi, Romania. We will present an overview of these experimental and theoretical studies, with special focus on the application potentialities.

## II. SPECTRAL STUDY OF ORDER- DISORDER EQUILIBRIUM IN LIQUID AND SOLID SOLUTIONS

DANA ORTANSA DOROHOI<sup>1</sup>, MIHAELA AVADANEI<sup>2</sup>, MIHAELA MARIA DULCESCU<sup>1</sup>,  
CRISTINA DELIA NECHIFOR<sup>1, 3</sup>, ECATERINA CRANGEANU<sup>1</sup>, MAGDALENA  
POSTOLACHE<sup>1</sup>, ALINA ROGOJANU<sup>1</sup>

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### Abstract:

In the interior of liquids, each component particle supports the action of the rest of the molecules. Spectral shifts measured in ternary homogeneous solutions can be used when estimates the composition of the first solvation spheres of the spectrally active molecules when the binary solvent is made by active and inactive from the intermolecular interactions liquids. The average statistic weights of the two solvents in the first solvation sphere of some dipolar spectrally active molecules are compared with the molar fractions of the solvents in the studied solutions, in order to argue the in-homogeneities induced in ternary solutions by dipolar interactions.

In polymer foils the mechanical action arranges the polymeric chains in the etiration process. The order degree induced by etiration influences the anisotropy of the polymer films. The birefringence and the dichroic ratio are considered as indicators of the degree of order of the PVA films.

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**III MICROELECTROMECHANICAL SYSTEMS SWITCHES: DIELECTRIC  
CHARGING EFFECTS**

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**Abstract:**

Dielectrics play a vital role in MicroElectroMechanical Systems (MEMS) performance and reliability [1, 2]. However, the influence of dielectric properties and behavior on device performance is still poorly understood [3, 4] and a substantial contributor to device failure.

This paper analyzes how the parasitic electric charge accumulates into the dielectric material used as insulator in a MEMS switch. It is proposed the employment of a triangular voltage to measure the actuation voltage and to discriminate between the top-injected charge and the bottom-injected charge. A relationship between the displacement of the metallic bridge, the applied voltage and the parasitic charge will be presented and used to find an analytical expression for the actuation voltage. Detailed analysis of the stored charge, including the landscape of the thermal activation energies involved, the charge amount stored under different conditions and the relaxation time, was obtained by using the final thermally stimulated discharge current technique. A comparison of the experimental data and simulated data gives indication about the best way to estimate the actuation voltage.

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**VI APPLICATION OF THE FORC DIAGRAM METHOD IN THE CHARACTERIZATION  
OF THE BISTABLE SYSTEMS**

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EPIPHANE CODJOVI<sup>3</sup>, ALEXANDRU STANCU<sup>4</sup>, ADRIAN GRAUR<sup>1</sup>, VALENTIN POPA<sup>1</sup>,  
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**Abstract:**

FORC (First Order Reversal Curve) diagram method is already widely accepted as an investigation tool of the interactions in hysteretic systems. This method brings complementary information to the classical major hysteresis loop method, allowing the study of a single family of individuals (single-domains in our case) behavior by taking into account the interactions of this one with the others individuals constituting the whole studied system.

The FORC diagram method was initially proposed for the study of the interactions in the ferromagnetic systems of nanoparticles [1], being afterwards progressively applied to the study of the magnetic nanopillars systems [2], magnetic nanowires arrays [3], etc. Recently, it has been shown that this method can also be applied in the characterization of spin crossover compounds in studies like: dilution effect [4], interactions study in the 1D spin crossover systems [5], pressure and size effects [6].

In this paper we present the main applications as well as the kind of information which can be obtained starting from a FORC study in the magnetic nanowires arrays and in the spin crossover systems.

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S1-O1

QUANTUM COMMUNICATIONS IN GRID COMPUTING

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**Abstract:**

The Quantum Crypted GRID Port developed under the D11-044 QUANTGRID project financed by the Romanian Center for Programme Management CNMP is presented: specifically the technology developed and the proprietary software used in the project. Quantum crypted communications eliminate the possibility of quantum-computer deciphering of messages (Shor's Lemma), while functioning with a public key exchange scheme – being secure by the very essence of quantum nature: any quantum state measured in any way collapses into one of its projections, thus it cannot be cloned and impossible to keep a copy thereof. The distribution of quantum public key is hence similar to the Vernam cipher (symmetrical – with secret key). The ongoing activities in this technology pertain to GRID communications through optical fiber and allow optimising the quantum security technology and experimenting proprietary algorithms for optimum data-volume/security for this new type of communications.

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S1-O2

QUANTUM TUNNELLING OF BOSONS IN ELECTRO-MAGNETIC STATIC FIELDS

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**Abstract:**

In the present paper, with consider the quantum mechanical tunneling process of the relativistic complex charged massive bosons evolving in a strong static electric field orthogonal to a weak magnetic induction. Working in Cartesian coordinates, we solve the Klein-Gordon equation and express the solution in terms of the parabolic cylinder functions. Within the JWKB formalism, we deal with the particle creation process and derive the probability amplitude and the corresponding transition rate

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S1-03

**ON MAXIMAL VELOCITY IN VARIOUS CLASSICAL AND QUANTUM SET-UPS**

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**Abstract:**

A discussion of the velocity of propagation of signals will be given in various theories and set-ups. To start, it will be shown that relativistically invariant theories with infinite incompressibility exist, contrary to what is usually stated. The price to be paid is that these theories are not local. Then, the notion of causality and explicit time evolution will be introduced for some nonlocal theories. Time permitting, possible practical applications, including superluminal propagation in usual quantum mechanics, will close the presentation.

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S1-04

**QUANTUM PHASE TRANSITION IN A 1D ANHARMONIC CHAIN WITH APPLICATIONS TO NANOPHYSICS**

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**Abstract**

Using the transfer matrix technique, the thermodynamics of a planar array of Ginzburg-Landau chains is studied together with a chain of quantum anharmonic oscillators. Using the critical condition of the Ising-like phase transition in the 2D classical system, the phase diagram of the 1D quantum system is obtained. The result is in good agreement with previous Monte Carlo simulations. Some physical applications for atomic chains are discussed.

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S1-O5

**LAMBERT FUNCTION AND SOME TRANSCENDENTAL EQUATIONS OF  
NANOMAGNETISM**

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**Abstract:**

Recently, several authors pointed out the utility of the Lambert functions in various physical contexts. In this communication, two applications in obtaining analytical solutions of transcendental equations of nanomagnetism are presented and their physical relevance is discussed.

**References**

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S1-O6

**MATHEMATIC MODELING TO OPTIMIZE THE OBTAINING PROCESS OF NEW  
XANTHINE DERIVATIVES**

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**Abstract**

The optimal conditions for the reaction of paracetamol with theophylline were established, in order to obtain new xanthine derivatives with remarkable pharmacological properties. The reaction yield was chosen as optimization factor. Temperature and reaction time were considered as being significant factors influencing the reaction yield. Factorial experiments were organized for each reaction and the reaction yield was determined for various values of reaction time and temperature. Elemental and spectral (FTIR and <sup>1</sup>H NMR) analyses were made in order to confirm the structure of the reaction products. Mathematic models for the reactions' yield were obtained on the basis of factorial experiments. Finally, the values of the significant factors (reaction time and temperature) corresponding to the maximum yield of reaction were established.

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S1-07

**THE ADVANCED SECURITY MODEL FOR WIRELESS DATA TRANSMISSIONS, BASED  
ON IMPROVED RSA ALGORITHM COMBINED WITH RNS IN A CONVOLUTIONAL  
CRYPTOSYSTEM**

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**Abstract**

The wireless broadband technology changes the way people experience communications and enables new freedom in mobile information, interaction, user-generated content, and social networking. In this paper we want to develop a new convolutional cryptosystem which combines Residue number system (RNS), public-key cryptography and convolutional codes. Convolutional codes ensure the implementation of a dynamic cryptosystem and the minimization of time spread introduced in the transmitted signal in the wireless channel. To secure the plaintext, the convolutional coding technology is associated with RNS-based RSA public-key cryptography. A non-linear 8-bit cryptosystem using moduli set (111, 115, 119) is implemented in a Virtex-4 FPGA. The three parallel channels due to the moduli set is each associated with a digital signature and symmetric ciphers. Cryptanalysis shows that additional number of plaintext-ciphertext pairs needed to completely break the cryptosystem is increased compared to existing cryptosystems. The increased security is as a result of the cryptographic complexity being propagated through the different channels established using the moduli set. To our knowledge, this is the first proposal of a hardware implementation in a single PAGA of cryptosystem using public-key cryptography and convolutional codes.

**Keywords:** security, ciphertext, moduli set, encryption algorithm, field programmable gate array (FPGA), residue number system (RNS); very-high-speed hardware description language (VHDL), Rivest, Shamir and Adleman (RSA), cryptosystem.

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S1-O8

**DYNAMICS OF BLOCH ELECTRONS IN TIME DEPENDENT ELECTRIC FIELDS:  
ESTIMATES FOR ARBITRARY ORDER INTER-BAND TRANSITIONS.**

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**Abstract:**

The aim of this paper is to obtain upper bounds for inter-band transitions of Bloch electrons in a slowly varying in time electric field. The interest in this problem is connected with the invention of superlattices that has allowed the experimental observation of Stark-Wannier ladder, Bloch oscillations and harmonic spatial motions of electrons and the construction of semiconductor quantum oscillation devices.

From physical point of view, it is important to find the values of the electric field and frequency for which the inter-band transitions are still small on the relevant times scale. Using adiabatic expansion formalism, upper bounds for inter-band transition up to a higher order are obtained.

It is proved that for electric fields  $E \ll 107 \text{ V/m}$  and frequencies  $\omega \ll 10^{12} \text{ s}^{-1}$ , the inter-band transition are still small. These bounds imply the validity of one band approximation on time scale of the order of the period of Bloch oscillations.

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S1-P1

**ALGEBRAIC COMPUTING PROGRAMS FOR GAUGE THEORIES**

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**Abstract**

We develop two algebraic computing programs devoted to the study of gauge theories. One of them applies to gauge theories defined on a commutative space-time [1] and the other extends the corresponding computing procedures to the noncommutative case [2]. The calculations are performed analytically using the GRTensorII computer algebra package, running on the MapleV platform, along with specific routines. As applications we consider the  $U(2)$  gauge theory [3] defined both on commutative and noncommutative space-times.

Acknowledgements. The author acknowledges the support of CNCSIS-UEFISCSU Grant No. ID-620 of the Ministry of Education and Research of Romania.

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S1-P2

VARIATIONS OF THE GRAVITATIONAL CONSTANT WITH TIME IN THE  
FRAMEWORK OF THE EXPANDING UNIVERSE

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**Abstract:**

This paper shows that the variation of certain fundamental constants is practically impossible in a physical time frame of reference. We can have as many time frames of reference we want but when we transform them all into physical time frames of reference, with time as a measure of movement, physical equations retain their form and meaning and values of certain physical quantities and fundamental constants are the same. Therefore the question of variation of certain fundamental constants is only possible for those frames of reference other than physical time.

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S1-P3

ENERGY-MOMENTUM LOCALIZATION - A SHORT HISTORY

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**Abstract:**

Energy-momentum localization has remained an open issue in General Relativity, inspite the hard work done by many researchers for clarifying this basic problem. The problem consists in elaborating a generally accepted definition for energy-momentum, and thus overcoming the coordinate dependence of different definitions. In this paper, we make a short history of energy-momentum localization pointing out the most important definitions and previously obtained results. In recent years, a significant increase of the research work on this topic has taken place. We mention the importance of superenergy tensors, quasi-local mass definitions, the pseudotensorial prescriptions of Einstein, Landau-Lifshitz, Papapetrou, Weinberg (ELLPW), Bergmann-Thomson, Qadir-Sharif and Møller, tele-parallel gravity theory and the similarity and connections between these gravity theories. We notice the meaningful and identical expressions for energy yielded by different prescriptions. As a conclusion, we illustrate that further investigations are needed for many space-times.

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S1-P4

**EFFICIENCY OF USING A VIRTUAL PHYSICS LABORATORY**

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**Abstract:**

In recent years, almost every aspect of the teaching-learning process has been influenced by ICT, and this includes virtual learning methods. Virtual learning methods need continual improvements for enabling the users to expand their possibilities of learning using a virtual platform. The advancing of new technology and developing of new computational programs such as Java and Flash make the educational activities more effective and efficient. Now e-learning represents a growing area which is present in many universities. Based on our experience, we created an e-learning environment, the Virtual Physics Lab, which contains a set of simulated experiments elaborated in Adobe Flash CS3 and a Chat window that allows both teacher - students and students- students discussions. This year we have tested the efficiency of the Virtual Physics Lab and the impact on the learning process and concluded that we provide a successful implementation of this learning method because the students are interested in working in the Virtual Physics Lab. They access the e-learning environment from the student campus using their personal computers before or after working in the real physics laboratory. The statistics show that a great percentage of students prefer to work in the Virtual Physics Lab before working in the real physics laboratory. Also, more than 50% of the students have chosen to work in the Virtual Physics Lab after two months from its implementation in the learning process. The students consider that working with simulated physics experiments is more interesting. Consequently, we want to increase the number of physics simulations and describe more physics laws and phenomena in the future.

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S1-P5

**COMPUTATION OF THE ELECTROMAGNETIC FIELD IN WOOD HEATING**

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**Abstract.**

The paper presents a study of electromagnetic field processing of wood in microwave structures. Water presents a support for high frequency electromagnetic field conversion in heat. This characteristic presents an important advantage in drying process. The numerical and experimental results allow the establishment of optimum temperature for drying wood in high frequency electromagnetic field. We consider that the evaporation of water takes place only on the surface of the wood, the speed of vaporization depending on the difference between the temperature on the surface and the exterior temperature.

S1-P6

**PEROVSKITES-LIKE MAGNETIC MATERIALS PROPERTIES PREDICTION BY  
INNOVATIVE COMPUTATIONAL SIMULATION IT-BASED TECHNIQUES**

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**Abstract:**

The design close to the fabrication and the characterization of advanced new magnetic materials are still major objectives for the present materials research. The genuine progress on the computational methods, on the experimental IT-based technique, dedicated to the magnetic materials simulation and modelling allow new understanding of our experimental data. We accumulate new data on some perovskites-like magnetic materials properties using structure (by X-ray or neutron diffraction, XRD/ND methods), and also based on the magnetoresistance and magnetization measurements. Since new phenomena and new properties appear all the time, the concept of "materials and structures by design" is particularly important to material sciences and engineering.

In the last ten years we worked to the design of new magnetic materials and nanomagnetic materials. Recently we studied and perform simulations for some nanomagnetic materials available in zero-dimensional '0D', particulate systems; one-dimensional 1D: wires, tubes, ribbons; or two-dimensional, 2D: nanomagnetic films. When reducing the scale of the magnetic entity to a few nanometers, the exchange coupling is comparable or even greater than the thermodynamic interactions so the grains will be exchange coupled one to each other. We explain already that, the new development techniques allows the 'discovery' of some new structure-properties relationship for this class of materials. The present work give some explanation on how to obtain new magnetoresistive perovskites-like nanomaterials, using new simulation methods strictly correlated with the experimental validation. Parts of this work seek to establish the necessary parameters for the theoretical model capable to explain and later to obtain a nanomanganite with predicted properties: molar magnetization, Curie and transition temperature, variation of the magnetoresistance with temperature.

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S1-P7

STATISTIC MODELING AND OPTIMIZATION FOR THE CHLOROSULPHONATION OF  
ACETANILIDE

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**Abstract:**

The study for the acetanilide chlorosulphonation has been done through a complete factorial experiment, 2<sup>3</sup> types, in order to obtain a mathematical model, subsequently used for the complete knowledge of the process. This could be done by feign and optimize the process regarding the input conditions. The obtained regression equation is goal function with 3 decision variables. For solving the optimization with restrictions, Hessian determinants and ridge analysis method based on Lagrange multipliers have been used. The ultimate goal is to establish the optimal conditions needed to lead the process in order to provide a low toxicity and increase its economic efficiency.

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S1-P8

NEURAL MODELING AND SIMULATION FOR THE CHLOROSULPHONATION OF  
ACETANILIDE PROCESS

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**Abstract:**

We studied the acetanilide chlorosulphonation process by the neuronal modeling. The type of artificial neural networks used in this application is the multilayer perceptron, *MLP*. Testing many topologies and performance evaluation, the neural networks have been designed. The neural model *MLP(3:6:1)* resulted. The neural network modeling of acetanilide chlorosulphonation is very efficient in predicting the evolution of a process, providing a good approximation of the studied process, further used for the interpolation and extrapolation of the results beyond the experimental range.

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S1-P9

**ON THE ROTATIONAL FLOW OF A NEWTONIAN FLUID BETWEEN TWO CIRCULAR CYLINDERS**

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**Abstract.**

In this paper the velocity field and the tangential shear stress corresponding to the rotational flow of a Newtonian fluid in an annular domain are determined by means of the Laplace and finite Hankel transforms. Initially, the fluid is at rest and the motion is produced by the rotation of the both cylinders about their common axis.

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S1-P10

**AN ANALITIC SOLUTION FOR MHD FLOW OF A NEWTONIAN FLUID IN POROUS SPACE**

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**Abstract.**

The velocity field corresponding to the unsteady magnetohydrodynamic (MHD) flow of an incompressible Newtonian fluid in porous half space is determined by means of Laplace transform. The solution is presented as a sum of the steady-state and transient solution. In this problem, we are discussing the Stokes first problem for Newtonian fluid as a limiting case. The effect of MHD and porosity on the fluid motion is shown by graphical illustrations.

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**S1-P11**

**GRAVITATIONAL SHIELDING THROUGH AN ELECTROMAGNETIC FIELD**

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**Abstract:**

It is shown that in a fractal fluid the gravitational field is expelled by means of an electromagnetic field. Some exotic experiments like Ciano's effect, Prodkletnov's effect are analyzed in this paper.

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**S1-P12**

**GRAVITATIONAL EXOTIC EFFECT IN FRACTAL FLUID**

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**Abstract:**

The quantizations of the gravitational flux, the gravitational magnetron, the gravitational Meissner effect are analyzed in a fractal fluid. Some correlations with experimental cosmological data are presented in this paper.

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S1-P13

**FRactal Model to Evaluate *in vitro* Release Kinetics  
of Benzylpenicillinum from Dissolvable Polymeric Blends**

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**Abstract**

A fractal model was proposed in this paper in order to evaluate the kinetics of drug release from polymeric matrix. The model was validated with studies concerned on the release of benzylpenicillinum from dissolvable polymeric blends, between poly (vinyl alcohol) and poly (hydroxy urethane), in distilled water (pH=6) at 29 °C ( $\pm 1^\circ\text{C}$ ). The mechanism that led to the release of benzylpenicillinum was an anomalous transport.

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S1-P14

**THE TRANSITION TO CHAOS IN A SYSTEM  
OF ASYMMETRIC COUPLED THREE LOGISTIC MAPS**

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**Abstract**

The aim of this paper is to present numerical results concerning the transition to chaos in a system of three asymmetric coupled logistic maps. Each map is coupled to one neighbor on one side. The strength parameters are chosen so that two of these maps lie in regular motion and one of them lies in chaotic motion when decoupled.

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S1-P15

**ON THE TRANSITION TO TURBULENCE  
IN A SYSTEM OF ASYMMETRICALLY COUPLED CHAOTIC MAPS**

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**Abstract.**

The aim of this paper is to present numerical results concerning the onset of turbulence in a system of seven asymmetric coupled chaotic maps. The logistic map is used as a chaotic map. It is found that, if one of the maps lies in chaotic motion and the rest of the maps lie in regular motion when they are decoupled, the increase of the coupling parameter determines an increase of the number of modes whose behavior is chaotic and for values of the coupling greater than a critical value the number of modes necessary to model turbulence is equal with seven, i.e. is equal with the dimension of the system.

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S1-P16

**THE ELECTRICAL CONDUCTANCE QUANTIFICATION IN NANOSTRUCTURES: A  
THEORETICAL APPROACH**

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**Abstract**

Considering that the charge carrier movements take place on fractal curves, the electrical conductance quantification in nanostructures is explained using an extended model of scale relativity theory. It is shown that this quantification take place when the transport phenomena are achieved by quasi-autonomous regimes. The universal 0.7 experimental structure is theoretically evidenced. At microscopic scale, the electrical conductance is controlled by means of the nanodilaton coherence. When the external field exceeds a critical value, the nanodilatons which stock the energy break down and simultaneously release the energy to the environment.

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**S1-P17**

**MODELING OF NANOSTRUCTURES THROUGH FRACTAL SPACE-TIME THEORY.**

**PART II**

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**Abstract.**

In this paper we will present three ways to define the length of a regular curve. Based on this, we will be able to attempt, a rigorous definition of fractal curves. These curves are essential to our theory of space applicable to nano-scale phenomena.

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**S1-P18**

**NEW EXACT SOLUTIONS FOR MOTIONS OF BRINKMAN TYPE FLUIDS**

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**Abstract**

Brinkman equation is used to model three distinct motions of the linearly viscous fluid through porous media. Exact solutions are established for the flow between two infinite parallel plates one of them oscillating or moving with a time-dependent velocity. The time-periodic plane Poiseuille flow is also studied. All solutions are determined by means of Fourier sine transform.

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Section 2. Physics and Technology of Condensed Matter

S2-O1

EFFECT OF RUBBING MATERIAL TEXTURE ON POLYIMIDE FILMS MORPHOLOGY

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**Abstract**

Thin polyimide films were prepared from 5-(2,5-dioxotetrahydrofurfuryl)-3-methyl-3-cyclohexene-1,2-dicarboxylic acid anhydride and some aromatic diamines: 1,4-(p-aminophenoxy)benzene and 1,4-bis(p-aminophenoxy)benzene in order to evaluate their suitability as liquid crystal alignment layers. Their surface was patterned by subjecting the polymer surface to a rubbing process with two different textile materials: cotton velvet and synthetic velvet. Effect of textile fiber on rubbed polyimide films morphology was investigated through atomic force microscopy (AFM) measurements. The different sizes of the nanochannels are dependent on both fiber dimension and flexibility. Rubbing of polyimide films with cotton velvet, which presents smaller and rigid fibers comparatively to synthetic velvet, increases the depth of the resulting grooves. Therefore, the stability and pretilt angle of liquid crystal molecules is enhanced, recommending these materials for liquid crystal display devices applications.

The financial support of European Social Fund – „Cristofor I. Simionescu” Postdoctoral Fellowship Programme (ID POSDRU/89/1.5/S/55216), Sectoral Operational Programme Human Resources Development 2007 – 2013 is acknowledged.

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S2-O2

THE HARTREE-FOCK EQUATIONS APPLIED TO IMPURITY SYSTEMS

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**Abstract:**

We used different quantum chemical methods (Hartree-Fock, DFT (Density Functional Theory) or semiempirical approaches) to obtain the electronic structure and the physical and chemical properties of different molecules. The investigated properties are: intermolecular interaction energies, partial atomic charges in molecules, molecular electrostatic potentials, molecular orbital energies, reactivity indices, etc. From the theoretical point of view we were looking for the best exchange-correlation functionals and basis sets able to provide the best compromise between the accuracy and computational resources.

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S2-O3

FTIR SPECTRA PARTICULARITIES FOR ANTIQUE POTTERY

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**Abstract:**

In the analysis of objects with heritage value is always necessary that the technique used to be one that does not affect the researched object. In the case of ceramic analysis by FTIR spectroscopy is a method that has several advantages: it is a non-destructive technique, is fast, the equipment used is not very expensive and is found in the majority of analytical laboratories, may provide information relating to the materials used and even the conditions of processing.

The purpose of this paper is to present the results obtained from the analysis of IR absorption spectra for three distinct categories of ceramics, taken from different archaeological sites. The typical reflection spectra were realized in the wavelength range from  $5000\text{ cm}^{-1}$  to  $500\text{ cm}^{-1}$ . The reflection spectra in the range of  $5000\text{ cm}^{-1}$  –  $1300\text{ cm}^{-1}$  contain bands structurally identical and only for  $\nu < 1300\text{ cm}^{-1}$  some changes can be observed, such as the forming of a new band or the selective amplification of bands.

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S2-O4

COMPARATIVE STUDY ON TWO MAGNETIC FLUIDS – BASED ON  $\text{CoFe}_2\text{O}_4$  AND  $\text{ZnFe}_2\text{O}_4$  NANOPARTICLES, PREPARED BY CO-PRECIPIATION METHOD

ECATERINA FOCANICI<sup>1</sup>, MANUELA URSACHE<sup>1</sup>, VALENTIN NICA<sup>1</sup>, DORINA CREANGA<sup>1</sup>, OVIDIU CALTUN<sup>1</sup> and CRISTINA STAN<sup>2</sup>

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<sup>2</sup>*Politehnica University Bucharest*

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**Abstract.**

In this paper, we report the synthesis and the characterization of some two aqueous magnetic colloids intended for various applications in the field of life sciences.  $\text{CoFe}_2\text{O}_4$  and  $\text{ZnFe}_2\text{O}_4$  superparamagnetic particles were synthesized by chemical co-precipitation technique, diluted sodium oleate in aqueous solution being used - due to its biocompatibility, to coat the ferrophase particles. The results of Atomic Force Microscopy (AFM) and X-rays diffraction (XRD) investigations were comparatively discussed for the two ferrofluids from the viewpoint of granularity with consequences on the ferrofluid stability. No more than 25 nm average physical diameter was evidenced by AFM scanning while 9.07 and respectively 9.68 nm were the calculated values of ferrophase crystallites as provided by XRD data. Magnetic properties investigations were also accomplished the saturations magnetization and magnetic diameter values being assessed, the numerical data sustaining the presumption of biocompatibility and applicability in biomedical or biotechnological domains.

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S2-05

ADAPTIVE TRANSMISSION POWER IN BODY AREA NETWORKS

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**Abstract.**

Transmission power control in a sensor Body Area Network, used for chronicle patient monitoring (on different parameters: pulse, glucose or moving), is important to optimize the energy consumption and the battery life-time. The sensor network works at the ISM (Industrial Scientific and Medical) frequency of 2.4 GHz, according to the IEEE 802.15.6 standard. Data communication is the most important power consumer. Therefore adapting the transmitted power to the traffic change and to the patient feedback is very important. Body parameters variations can be used for traffic prediction and to change the transmission power. A constant transmission level requests a higher value of the power to ensure the quality of communication in the worst case (maximum distance between nodes, major disturbances). It is not recommended to maintain a high power level so we propose to classify traffic in a few fuzzy classes, based on some statistical analysis, as wireless communication networks do. Traffic classes are associated with different fixed power levels, adapted to each class. The method is fast, reliable and efficient because power adaptation is made with few processing resources. The method is exemplified based on some examples from the literature. The results obtained by simulations are presented in comparison to other methods.

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S2-06

ELECTROMAGNETIC PARAMETERS DETERMINATION FOR THE 5CB AND 8CB  
LIQUID CRYSTALS USED FOR NOVEL TUNABLE METAMATERIALS

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**Abstract:**

Two liquid crystals (LC) have been considered: the 5CB – a nematic liquid crystalline compound of 4-cyano-4-n-pentylbiphenyl and the 8CB - a thermotropic liquid crystal of 4-n-octyl 4'-cyanobiphenyl, with applications to the novel tunable metamaterials. We have performed a structural simulation using the HFSS program (Ansoft Technologies), in order to determine the magnetic permeability of some metamaterials obtained with different nanoparticles dispersed in the LC matrix, considering each material particularities. The frequency range of interest is the centimeter (microwave) frequency range (10 – 28 GHz). The eigenmode solver of the HFSS program was set to give the resonant frequencies of each metamaterial, imposed by its internal structure. The magnetic properties of these materials can be tuned by varying the volume fraction of nanoparticles and the nonlinear character of this evolution was pointed out.

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S2-P1

**CONDUCTION PROPERTIES OF PHOSPHORUS-MODIFIED POLYSULFONES**

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ECATERINA AVRAM<sup>1</sup> AND SILVIA IOAN<sup>1</sup>

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**Abstract:**

Conduction properties of phosphorus-modified polysulfones were investigated to establish the effects of the substitution degrees and of the bulky phosphorus pendant groups bound in different positions, in the large domain of frequencies and temperatures. These polymers were obtained by chemical modification of the chloromethylated polysulfones, performed by reacting the chloromethyl group with the P-H bond of 9,10-dihydro-oxa-10-phosphophenanthrene-10-oxide. The variation of conductivity with frequency at different temperature is expressed by  $\sigma \propto f^n$ , where values obtained for the "n" exponent characterize electronic conduction *via* a electronic hopping process and a model based on the energy bandgap representation could be suitable for explaining the temperature dependence of the electrical conductivity.

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S2-P2

**SURFACE AND INTERFACIAL PROPERTIES OF CELLULOSE  
ACETATE - POLYSULFONE BLENDS**

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**Abstract:**

The correlation between surface tension parameters and the chemical composition of thin films composed from cellulose acetates (with different substitution degrees) (CA) and quaternized polysulfone (with N-dimethylethanolamine) (PSFQ) blends was analyzed in order to knowledge your surface properties and to diversifies the applications as biomaterials and semipermeable membranes. The results concerning the surface tension properties of cellulose acetate with different substitution degrees show that the polar components obtained for each cellulose acetate have a lower electron donor parameter, comparatively with the electron acceptor one, and also that the apolar components of surface free energy are higher than the polar components. Generally, increase in the cellulose acetate substitution degrees determines a decrease of hydrophilicity. Also, the total surface tension of quaternized polysulfone is dominated by the polar component, and that the total surface tension and the polar component increase with the quaternization degree of the ammonium groups.

Theoretical study of surface properties obtained for these polymers blends at different compositions indicates the slightly modification of polar and disperse components *versus* substitution degrees of cellulose acetate. Also, the compensatory phenomenon in polymers blends determine an increasing of polarity with increasing composition of quaternized polysulfone. The study illustrates the importance of such structural and compositional characteristics in tailoring specific applications of CA/PSFQ mixtures.

S2-P3

**DIELECTRIC PROPERTIES OF SOME POLYSULFONES WITH QUATERNARY GROUPS**

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**Abstract:**

Novel quaternized polysulfone with N-dimethylethylammonium chloride (PSF-DMEA) and N-dimethyloctylammonium (PSF-DMOA) chloride pendent groups was investigated by dielectric spectroscopy for evidence the influence of alkyle groups length on the dielectric constant and dielectric loss. The dielectric constant,  $\epsilon'$ , and dielectric loss,  $\epsilon''$ , were studied as a function of temperature and frequency. The dielectric constant of both samples decreases with increasing frequency, due to dielectric dispersion, and is higher for PSF-DMEA, with more flexible chains, comparatively with PSF-DMOA, and increases with increasing temperature, due to an increased total polarization, arising from dipoles orientation and trapped charge carriers.

The dielectric loss behavior exhibits two types of relaxation,  $\gamma$  and  $\beta$ , relaxation  $\gamma$  being more visible in the PSF-DMOA sample. In the case of  $\beta$  transition, dielectric dispersion is observed to be asymmetrical for the PSF-DMOA sample, due to the higher ionic dielectric loss, comparatively with the PSF-DMEA sample, where a symmetrical dielectric dispersion appears. Also, the higher rigidity of the PSF-DMOA sample will reduce the mobility of the sided groups, decreasing dielectric loss.

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S2-P4

**VISCOELASTIC PROPERTIES OF SOME EPICLON-BASED POLYIMIDE BLENDS**

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**Abstract:**

Viscoelastic behavior of some polyimide blend solutions based on epiclon (poly(5-(2,5-dioxotetrahydrofurfuryl)-3-methyl-3-cyclohexene-1,2-dicarboxylic acid anhydride, DOCDA) was investigated. Studies were carried out in N-methyl pyrrolidinone (NMP), maintaining a concentration of 42 % wt for all different mixing ratios: 25/75, 50/50 and 75/25. Rheological functions, such as complex viscosity,  $\eta^*$ , storage modulus,  $G'$ , and loss modulus  $G''$ , were recorded on a frequency range of 0.01-60 Hz to characterize the viscoelastic behavior. At low frequencies,  $f$ , the storage modulus and the loss modulus are proportional to  $f^{1.52-1.88}$  and  $f^{0.79-0.99}$ , respectively, and  $G''$  is always higher than  $G'$  in this frequency range, without any plateau appearing in  $G'$  versus  $f$  curves, which is a behavior characteristic to a viscoelastic fluid. Modification in the flexibility of the polyimide blend components is reflected in the values of crossover frequency where  $G' = G''$ , when the transition from the viscous flow to the elastic flow occurs. The behavior of investigated polyimide blends is suitable for obtaining flexible insulation layers used in electronic integrated circuits.

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S2-P5

### NANOSTRUCTURE OF ION CHANNEL

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**Abstract:**

In the ion channel models, based on the experimental dates, the constricted transmembrane segment is jointed to a vestibule at each side. Each vestibule is connected with a reservoir contained a number of ions. The constricted transmembrane segment is usually cylindrical and has a radius of 3-5 Å and a length of 10-12 Å. The ions which pass across a channel have the radius of angstrom order

The paper reports a theoretical study of the ion statistics and the conduction current in a ion channel, in a nanostructure model. From our analyse results that the ions in the constricted transmembrane segment, at a maximum concentration, form a degenerate system and the ensemble of ions in the reservoir is nondegenerate. For some particular concentrations, a ion channel is a quasi 1D or a 1D system.

A barrier for an ion represents those interactions between ion, water molecules, and the protein wall in the transmembrane segment. The ions have a probability T for traversal the barrier and a probability R of being reflected. The effect of such barrier on the ions is presented in the last section.

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S2-P6

### DICHROIC RATIO AND ORDER DEGREE OF ZWITTERIONIC MOLECULES IN POLY VINYL ALCOHOL STRETCHED FOILS

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**Abstract:**

The PVA films were colored with dipolar molecules and their dichronic ratio was estimated in order to obtain films with application in Optics of polarized light. The dependence of the dichroic ratio on the thickness of the PVA films and also on the degree of stretching was established in the case of three zwitterionic compounds from the class of carbanion disubstituted cycloimmonium ylids with different heterocycles. The dependence of the degree of order of the dichroic molecules in polymer films on the heterocyclic nature and on the degree of stretching was established.

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S2-P7

PHYSICAL PROPERTIES OF PVA FILMS WITH SULFATHIAZOLE

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**Abstract:**

Sulfathiazole is a short-acting drug used as oral and topical antimicrobial. In combination with sulfabenzamide and sulfacetamide it is used, sometimes, in aquariums. By using the molecular modelling software, the main physical-chemical characteristics of sulfathiazole were calculated. The biological activity was estimated from the difference between HUMO and LOMO levels. Thin films were obtained from PVA gel and sulfathiazole by drying in low pressure atmosphere and their surface properties were analysed. The induced by etiration birefringence of the thin films was also measured using a Babinet Compensator

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S2-P8

SPECTROSCOPIC FT-IR STUDY OF  $\text{SiO}_2$ -CAO- $\text{P}_2\text{O}_5$  XEROGELS

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**Abstract:**

Various materials may be coated with liquid sol-gel hydrolyzed, preventing corrosion, improving biocompatibility or electrical properties [1, 2]. Four kinds of gel-derived materials belonging to the  $\text{SiO}_2$  – CaO –  $\text{P}_2\text{O}_5$  system have been obtained by sol-gel process. The structures of the dried gels as well as the structural modifications that occur during the transformations in gel-derived glasses are analyzed by Fourier transform infrared spectroscopy (FTIR). It has been found that the evidence of the P –O-Si linkages begins to appear only on the FTIR spectra of the bulk gels heat treated up to 400 °C. The X-ray diffraction analysis (XRD) and FTIR results indicate that crystalline phases coexist in the samples treated at 400°C.

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S2-P9

**PRELIMINARY INVESTIGATIONS OF  $Fe_3O_4$ -FERROFLUIDS AT DIFFERENT TEMPERATURES BY MEANS OF MAGNETIC MEASUREMENTS**

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**Abstract:**

In this work we present preliminary results on a  $Fe_3O_4$  based ferrofluid dispersed in heavy water, using magnetic measurements. Magnetization curves are measured with an original setup (Department of Magnetism, Moscow State University) at different temperature in the range between 80K and 300K. As temperature decreases, the value of the saturation magnetization of the  $Fe_3O_4$  ferrofluid increases. For the two limits of the temperature interval, the change in the particle magnetic diameter is evaluated. It is shown that the results are consistent with the computation based on Langevin model.

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S2-P10

**MAGNETOGRANULOMETRIC CHARACTERISTICS AND FRACTAL TYPE DISPERSION WITHIN AN AQUEOUS FERROFLUID BASED ON MAGNETITE STABILIZED WITH TETRAMETHYL AMONIUM HYDROXIDE**

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**Abstract**

In this paper we propose a relationship between the granularity properties and the multifractal characteristics of the magnetite nanoparticles coated with tetramethylammonium hydroxide (TMA-OH) and dispersed in deionized water. The microstructural investigation was carried out using transmission electron microscopy (TEM) and magnetization properties measurements. We found a fractal type of nanoparticle dispersion in the TEM image of the investigated ferrofluid. The computation was carried out for different zones of the TEM image, the multifractal spectra being quite similar, with the fractal box-counting dimension in the neighborhood of 1.85. The interpretation was based on the physical features of magnetic cores co-precipitation process as well as to the non-magnetic shell formation during the nanoparticle stabilization, considering the balance between the magnetic dipole attractions and electrostatic repulsions within the magnetic fluid volume.

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S2-P11

**XPS INVESTIGATION OF THE ATOMIC ENVIRONMENT IN BINARY BORON-BISMUTHATE GLASSES**

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**Abstract**

X-ray photoelectron spectroscopy (XPS) was employed to investigate  $B_2O_3$ - $Bi_2O_3$  vitreous samples with different B/Bi ratios, considering the large interest for heavy-metal glasses based on  $Bi_2O_3$  oxide in the field of optical and electronic devices. The glass samples have been prepared by melting the corresponding mixtures of  $B_2O_3$  and  $Bi_2O_3$  at  $1100^\circ C$  and rapidly cooling at room temperature. XPS is an important and powerful technique for investigating the electronic structure and the bindings in solids as well for describing the local structure. From the analysis of the XPS spectra for the Bi  $4p$ , B  $1s$  and O  $1s$  core levels, several changes are identified in terms of various structural units being present, reflected by the changes occurred in the atomic environments of bismuth and boron atoms. All O  $1s$  spectra were deconvoluted into two Lorentzian-Gaussian peaks corresponding to bridging and non-bridging oxygen atoms and the variation in the ratio of their peak areas is discussed in terms of the local structure as well.

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**S2-P12**

**MICROSTRUCTURE STUDIES OF MILLED HARD AND SOFT MAGNETIC PHASES FOR EXCHANGE COUPLED NANOCOMPOSITE<sup>a</sup>**

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**Abstract:**

Our previous studies on exchange coupled nanocomposites, with different concentrations between the hard magnetic phases (Nd<sub>2</sub>Fe<sub>14</sub>B or SmCo<sub>5</sub>) and the soft magnetic phases (Fe or Fe-Co alloys) do not present sufficient high coercivity and remanence. One of the reasons for this behaviour could be the poor crystallinity of hard magnetic phases which results after the milling. The crystalline structure could be refined by appropriate annealing. Since the recrystallization temperature of hard magnetic phases are higher than the recrystallization temperature of milled soft phases [1], a solution must be found in order to obtain a good crystallinity for hard phases and to hinder the growth of the crystallite size of Fe from the composite. In order to find an appropriate annealing of the milled powders, an individual structural, microstructural and magnetic study of the hard and respectively soft magnetic phases is proposed. To obtain a good crystallinity for hard phase and, in the same time, to minimise the increase of crystallite's size of soft phases, the milled samples have been subjected to different annealing processes. Differential scanning calorimetry (DSC) was performed to establish the annealing temperature ranges. The influence of the annealing conditions on the structural, microstructural and magnetic behaviour has been studied by X-ray diffraction, electron microscopy (SEM) and magnetic measurements.

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S2-P13

**SYNTHESIS AND CHARACTERISATION OF ZINC CONTAINING PHOSPHOSILICATE BIOGLASSES**

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**Abstract:**

Bioactive glasses have attracted significant attention in recent years, especially for their insertion in composite biomaterials to serve as support in tissue engineering. These biomaterials have clinical applications also as a coating for implants, bone filling and, in a porous form, they are used for bone regeneration [1]. According to our best knowledge, ZnO-P<sub>2</sub>O<sub>5</sub>-SiO<sub>2</sub> system has not been studied until now. Zinc oxide addition to the phosphosilicate matrix was considered because zinc plays an important role in bone metabolism and *in vitro* it was demonstrated its stimulating bone regeneration effect [2]. The new SiO<sub>2</sub>-ZnO-P<sub>2</sub>O<sub>5</sub> bioglass system was prepared following the sol-gel route. This method permits to obtain, at room temperature, a wide variety of inorganic networks. The precursors used were TEOS (Si(OC<sub>2</sub>H<sub>5</sub>)<sub>4</sub>), zinc nitrate hexahydrate (Zn(NO<sub>3</sub>)<sub>2</sub>·6H<sub>2</sub>O) and dibasic ammonium phosphate ((NH<sub>4</sub>)<sub>2</sub>HPO<sub>4</sub>), while HNO<sub>3</sub> was used as catalyst. The properties that are of interest in the characterization of biomaterial surfaces include beside the chemical composition, hydrophilicity or hydrophobicity, the presence of ionic groups, also the morphology and the topography, that can influence the attachment of bio-organic molecules such as enzymes, proteins, antibodies or even cells[3,4]. The cells attaching to the surface of these composites is strongly influenced by the morphology and topography of the layer that comes in direct contact with biological environment. Therefore, structural and surface properties of the pellet samples were investigated using the atomic force microscopy (AFM), as well as thermal and X-ray diffraction (XRD) analyses. XRD results showed that the all samples have a prevalent amorphous character. AFM analysis indicated a rough, inhomogeneous surface of the as prepared pellets.

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**S2-P14**

**TiO<sub>2</sub> THIN FILMS FOR PHOTOELECTROCATALYSIS APPLICATIONS**

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**Abstract:**

One of the major problems of the contemporary world is that of the removal of contaminants from waste water. Chemical oxidation using certain anti-oxidants like ozone, hydrogen peroxide, chlorides cannot produce in all cases the total mineralization of water contaminants. In recent years catalytic technologies have proven to be an effective means for removal of organic pollutants. Processes of oxidation can increase the efficiency of mineralization, final products of degradation reactions being carbon dioxide, organic acids with molecular chains, inorganic ions short, which are much less toxic and are biodegradable.

The paper presents the first results obtained in the realization of a photoelectrocatalysis system, in order to study the influence of electric field in the photocatalysis process, assisted by TiO<sub>2</sub> thin film catalyst.

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**S2-P15**

**AFM STUDIES OF DC MAGNETRON SPUTTERED TiO<sub>2</sub> FILMS**

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**Abstract**

In this paper we will show some dimensional effects observed for TiO<sub>2</sub> films deposited by a dc circular magnetron reactive sputtering method.

We have found that there is a thickness strong influence for the surface structure of TiO<sub>2</sub> magnetron sputtered films. We have found that in dependencies of the thicknesses there is a strong variation of the film morphology. We have found that there is a columnar type of films for thickness up to 200nm and a planar type of films for thicker TiO<sub>2</sub> films.

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**S2-P16**

**SALICYLIC ACID RELEASE FROM DISSOLVABLE POLYMERIC BLENDS**

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**Abstract.**

*In vitro* Salicylic Acid release from some dissolvable polymeric blends, taking into consideration their swelling characteristics was made in this paper. This study was expected to provide information about the capability of poly (vinyl alcohol) and poly (hydroxy urethane) blends to satisfy specific requirements in development of controlled release systems. Films were prepared from polymeric blends with different ratio of poly (hydroxy urethane) containing 2% salicylic acid. Drug release experiments were recorded in distilled water as function of time. An evaluation using different mathematical models was made. The results show that the polymers which do not swell very fast have a rapid initial release rate. The release rate maintains constant after 25 minutes. A fast swelling followed by dissolution and a rapid initial release rate can be observed for the formulation with large concentration of poly (hydroxy urethane). The mechanism that led to the release of Salicylic Acid was an anomalous transport, and the kinetic model describing the release is Hixson-Crowell model.

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**S2-P17**

**NEW METHODS OF DESIGNING NANOMATERIALS BY MEANS OF A DNA PSEUDO-STRUCTURE FOUND IN HIGH TEMPERATURE SUPERCONDUCTORS**

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**Abstract**

As a result of graphic representation of the mass distribution of atoms from the *a-b* plane along the *z*-axis,  $M = M(z)$ , for many high temperature superconducting compounds, one notices a possible overlap of these slopes with the graphs of the logistic and tent map. Using special designed software, which uses correlation (covariant) functions one finds a correspondence between the experimental data, and the logistic and tent map, and represents graphically a so called DNA pseudo-structure of the superconducting materials. Assuming the uniqueness of this DNA pseudo-structure representation for all the materials, and not only for high temperature superconductors, one proposes new methods of designing nanomaterials.



S2-P18

ETHANOL SENSING USING ZINC OXIDE THIN FILMS

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**Abstract:**

Zinc oxide is an n-type semiconductor (due to oxygen deficiencies and interstitial Zn ions, which act as donors in the ZnO lattice) with wide bandgap (3.3 eV), high electrical conductivity, high optical transmission in visible domain and various applications as transparent conducting electrodes, buffer layers in solar cell technology or as a material in sensor technology.

ZnO thin films were prepared by thermal oxidation of metallic Zn films evaporated onto glass substrates. Thermal oxidation of Zn films was made in air in various conditions to obtain optimum samples for gas sensing. The oxidation temperature was varied between 300 and 400°C for times between 1 and 3 hours. For gas sensing measurements, silver electrodes were deposited onto ZnO films using the same evaporation technique.

The crystalline structure of ZnO thin films was investigated by means of XRD while surface morphology was studied by AFM. Also the film surface composition was determined from XPS spectra. The XRD diffraction spectra showed the presence of ZnO characteristic peaks for all investigated samples. The intensity of these peaks was found to increase with increasing oxidation temperature/exposure time. The Zn2p1/2, Zn2p3/2 and O1s peaks in the XPS spectra correspond to the binding energies of the two elements in ZnO.

Gas sensing properties were investigated as a function of ethanol concentration at different temperatures. The sensitivity was found to vary with temperature having a maximum at approximately 180°C. The maximum sensitivity increases with the increase of the oxidation temperature.

S2-P19

THE STUDY OF MAGNETITE STABILIZED BY OLEATE ION IN TWO DIFFERENT POLARITY FLUIDS

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**Abstract**

Based on the co-precipitation chemical method the magnetite nanoparticles were prepared from ferric and ferrous iron salts in the presence of ammonium hydroxide at high temperature. Ferrophase stabilization in the two carrier fluids was accomplished using oleic acid and respectively sodium oleate - two molecules able to ensure the uniform dispersion in two different polarity solvents - water and respectively hydrocarbons. The applications of standard methods of atomic force microscopy and X-ray diffraction as well as the determination of kinematic viscosity (capillary method) and superficial tension coefficient (picnometric method) revealed the submicron size, spinel structure, relatively high viscosity, of the two resulted ferrofluids that were comparatively discussed. It was concluded that both carrier liquids have incorporated submicron magnetite particles by means of oleate ions- the stronger interactions between magnetite core and oleate shell being assumed in the case of resulted oily ferrofluid.

S2-P21

PVA POLARIZATION FILTERS; OBTAINING AND CHARACTERIZATION

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**Abstract**

A procedure for obtaining PVA polarization filters in laboratory is described here. The polarizer obtained from iodine colored PVA films is compared with commercial Cokin polarizer.

S2-P20

ON SOME QUANTUM TUNNELLING EFFECTS AT SOME PHOTOACTIVE STRUCTURES WITH CHARGE TRANSFER USED AS NEW (BIO)SENSORS

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**Abstract:**

One knows the fact that the scientific research programs in the field of the new materials and nanomaterials have in the center of attention the concept of "thin film". This very fact brings about the design and accomplishment of some photovoltaic devices entirely structured from thin semiconductor layers which could be obtained by as simple, as cheaper and less pollutant as possible technologies. Among these new materials a special place is occupied by the biomaterials which include as well the photosynthetic pigments, known as chlorophylls (Chl). These organic compounds have important photoconductor properties, abundant resources and they can be obtained by simple and "clean" methods. This paper presents the results of the experimental researches on the influence of the microcrystalline Chl films upon the electro-optical and photovoltaic properties in the case of an **AllpChl:C<sub>6</sub>H<sub>8</sub>O<sub>6</sub>:Ag|Cu**. The analysis of the experimental results concerning the voltage in an open circuit  $U_{CD}$ , the photopotentials, the density of the dark current  $J_s$  and of the illuminating ones  $J_L$  (obtained by photoelectric measurements) as well as the study of the spectral characteristics have led to the conclusion that the microcrystalline chlorophyll (Chl) films determine a substantial improvement of the photovoltaic characteristic running parameters,  $U_{CD} \approx 650 \rightarrow 850$  mV,  $J_L \approx 15 \rightarrow 25$  mA/cm<sup>2</sup>, collecting factor  $C_F \approx 0.65 \rightarrow 0.78$ . This paper also suggests a model for the diagram of the energetic bands in which we try to explain the complex mechanism of the carriers transport at the system interfaces - mechanism dominated in this type of structure by the trapping-recombining, tunneling and injection phenomena through the photoelectric "intelligent" interfaces states of the "space charge limited current" (SCLC) / type. **Thus, there have been found similitudes between the photoelectric behavior of this photosystem type and the specific electro-optical behavior of the electronical device with "charge transfer" used as image sensors and biosensors in the information optical processing.** On taking into account this idea, the paper presents a means by which such a heterostructure could be used to detect some noxious elements favouring some neuroviral epidemics: **noxious elements (O<sub>2</sub><sup>-</sup>, HO<sup>-</sup>, H<sub>2</sub>O<sub>2</sub>) → (1)  $U_{CD} \approx (0.670 \square 0.820)$ mV,  $J_L \approx (18 \square 25)$ mA/cm<sup>2</sup> → (2) neuroviral epidemics.** We reveal that in the study of the independences between electric fields + the concentration of the C<sub>6</sub>H<sub>8</sub>O<sub>6</sub> (ascorbic acid) → proteic metabolism → photoconduction → photovoltaic characteristics and the height  $\Phi_B \approx (0.75-0.85)$  eV of the Schottky barrier at the interface photoactive region, it is necessary to take into account both the tunnelling and the recombination effects of the minority carriers, the influence of the image forces in the spatial charge region on the potential barrier and the structural features of the quantum dots (QDs) DNA<sub>Chl</sub>:Ag micelles from the AllpChl interface. At the same time we show by theoretical and experimental arguments as well as by modelling that a AllChl:Ag:C<sub>6</sub>H<sub>8</sub>O<sub>6</sub>|Cu Schottky nano-structure can be capable of disturbing a viral DNA sequence by quantum chemical tunnelling processes; suggesting the possibility of using such a nanostructure as intelligent target material in the photodynamic treatment of neuro-viral affections.

### 3. Optics, Spectroscopy and Plasma Physics.

#### S3-O1

#### OPTICAL AND MECHANICAL PROPERTIES OF PET FILMS AFTER PHYSICAL AND CHEMICAL MODIFICATIONS

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**Abstract:**

In this work, data related to structural changes of aminated surfaces of PET film are presented. The introduction of aliphatic amine units on PET surfaces that lead to amide functionalities has been achieved by plasma-precursor followed by chemical treatment with triethylenetetramine (TETA).

Changes in physical and chemical properties were evidenced by Fourier Transform Infrared - Attenuated Total Reflectance (FTIR-ATR), X - ray diffraction (XRD) and Dynamic Mechanical Analysis (DMA) measurements.

The spectral changes observed in the FTIR-ATR spectra of aminated PET film seems to be due to the combined effects of molecular orientation, conformational changes, initial degradation restricted to the amorphous regions, the chain scission of tie segments between crystallites and reaction of ester group with TETA.

XRD measurements demonstrated the influence of amination conditions (time of exposure, type of amination, etc) on crystallinity.

DMA gives the differences between the viscoelastic behaviour of the studied PET samples.

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#### S3-O2

#### MULTI-PEAK STRUCTURE OF THE ION CURRENT IN LASER PRODUCED PLASMA

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**Abstract:**

The experimental multi-peak structure of the transient ion current recorded by a charge-collector probe during the laser produced plasma expansion is reported for Sn and Li targets, and various focusing conditions and laser beam energies. Using a simple hydrodynamic model, the numerical simulations can reproduce well this type of behavior. Theoretically, a fractal hydrodynamic model is developed in a non-differentiable space-time. The solutions of Gaussian wave packet and 'bouncing' Gaussian wave packets types are found to explain the plasma expansion and to give a reasonable mathematical description of plasma splitting process.

S3-03

**LANGMUIR PROBE INVESTIGATIONS OF TRANSIENT PLASMA PLUMES  
GENERATED BY ULTRAFAST LASER ABLATION  
OF VARIOUS METALLIC TARGETS**

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**Abstract:**

The interaction of ultrafast laser radiation with target materials is a topic of high current interest, both for fundamental understanding of the complex processes involved, and for applicative potential in various fields, like plasma physics, material processing, analytical sciences, etc.

Using a Ti:Sa femtosecond laser (800 nm, 60 fs, 2 mJ/pulse) to ablate various metallic targets (Al, Cu, Mn, In and Ni) in vacuum generated transient plasma plumes which have been systematically studied by Langmuir probes. This classical technique allows a relatively straightforward recording of both ionic and electronic components of the ablation plume, giving access to fundamental plasma parameters as ion density, temperature or plasma potential.

This paper presents the first results of this systematic study. Previous optical and electrical investigations in the nanosecond laser regime [1-3] evidenced the occurrence of two distinct plasma structures, with different life-times and expansion velocities. Moreover, the first part of the transient ionic probe current exhibits an astonishing and not completely understood oscillatory behaviour. In the present study we show that this dynamics strongly depends on the bias applied on the target. This is also proved by simultaneous recording of the target potential evolution. The target material influence is further investigated.

Finally, some comparisons with previous experiments in picosecond and nanosecond regimes will be drawn, in an effort to better understand the effect of the laser – matter interaction timescale, by spanning it over six decades.

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S3-P1

CONSIDERATIONS ON SOME COMPOUNDS OF THE COMPLEX B VITAMINS

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**Abstract**

The aim of this paper is to characterize from the electro-optical point of view some organic compounds, known as vitamins, essentially for healthy human growth, metabolism, development, and body function. From this group we selected some, which are included in the complex B of vitamins.

After the molecular geometry optimization we obtained the electro-optical parameters in the ground electronic state. The atomic charges, the bond lengths, the electronic and vibration spectra, the electric dipole momentum, polarizability, refractivity, hydration energy and the difference between the energetic level HOMO (highest occupied molecular orbital) and LUMO (lowest unoccupied molecular orbital) were also calculated. The difference between the HOMO and LUMO energies can be used for the biological activity determination.

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S3-P2

ELECTRO-OPTIC PARAMETERS OF SOME CARBANION MONOSUBSTITUTED  
CYCLOIMMONIUM YLIDS

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**Abstract:**

Cycloimmonium ylids are dipolar, zwitterionic molecules frequently utilized in organic chemistry as precursors for new heterocycle compounds, as acid-basic indicators, or in dimerization reactions. The reactivity and the biological activity of the cycloimmonium ylids are essentially dependent on their electro-optical characteristics. The structural features, dipole moments, polarizabilities, energetic characteristics are important factors in their applications.

Quantum chemistry, by the computational programs, permits today to estimate in different degrees of approximation the ground state properties of isolated or included in solvent cages molecules.

The aim of this paper is to make a comparative theoretical study of some carbanion monosubstituted cycloimmonium ylids with different heterocycle as cationic part. HyperChem8.6.0 was used to characterize from the energetically, optical and spectral point of view the carbanion monosubstituted ylids. The results obtained from the electronic spectra of the analyzed molecules were utilized to estimate some electro-optical molecular parameters in the excited state of the studied molecules.

The visible intramolecular charge transfer band of cycloimmonium ylids was used in our studies. The mechanism of the cycloimmonium ylids visible electronic band determines the decreasing of the dipole moment in the excited electronic states of cycloimmonium ylids and consequently a diminution of the intermolecular strength in the excited states of the zwitterionic compounds.

S3-P3

NEW METHOD TO DETERMINE OF THE MAIN REFRACTIVE INDICES OF PET FOILS

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**Abstract:**

Due to its chemical, physical and mechanical properties, PET is widely used in various applications. The main refractive indices of the anisotropic foils must be known to design some applications in Optics. The previous measurements give for PET films information about its uniaxial anisotropy, or about very small differences between the two main refractive indices of this material. The aim of this study is to develop an interferometric method which permits us to evaluate precisely the three main refractive indices of the biaxially drawn polymer materials. It was based on an inclined incidence of a parallel beam on the film surface in the measure beam. In the compensation beam an adequate material was used in order to keep the central interference fringe into visual field of the Rayleigh interferometer.

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S3-P4

REFRACTIVE INDICES OF ORIENTAL CARPATHIANS QUARTZ. APPLICATIONS.

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**Abstract.**

The aim of this paper is to measure the main refractive indices of some Oriental Carpathian quartz crystals with Rayleigh interferometer. XRD analyses of the samples were made in order to evidence the presence of impurities in the quartz crystals. Some special anisotropic plates from quartz devoted to work at different wavelengths in visible range are also calculated in this paper. They can be used to change the polarization state of totally polarized radiations. The quarter wavelength plates are necessary in the experiments in which the circular polarized radiations are needed. The half-wavelength plates are used to improve the precision of the measurements when the optical activity is estimated

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S3-P5

**ELECTRO – OPTICAL PARAMETERS OF MICA CRYSTALS**

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**Abstract.**

The mineral samples analyzed in this paper belong to the mica groups which are biaxial crystals. Interferometric methods were used in order to determine the main refractive indices of mica samples. The main refractive indices of mica were measured at Rayleigh interferometer. Two main refractive indices ( $n_a$  and  $n_c$ ) were determined. The third main refractive index was calculated by solving the equation of the refractive indices surface with the value of refractive index determined for an inclined incidence. The angle between the optical axes was estimated on the basis of the values of the main refractive indices.

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S3-P6

**ELECTRICAL PROBES INVESTIGATION OF A PLASMA FIREBALL DYNAMICS**

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**Abstract:**

By positively biasing an electrode immersed in plasma being in equilibrium, at a certain value of the applied voltage, a quasi-spherical luminous plasma body spontaneously appears in front of it. This structure (fireball) consists of a positive core (ion-enriched plasma) confined by an electrical double layer. By gradually increasing the voltage on the electrode, the structure passes into dynamic state in which the double layer periodically disrupts and re-appears. Plasma fireball dynamics was investigated by means of cylindrical Langmuir probes. Periodic current bursts were observed in the dynamic current-voltage characteristics of the probes in the presence of a plasma fireball in dynamic state. The bursts appear in the probe characteristic when a certain relation exists between the fireball dynamics frequency and the frequency of the probe voltage sweep.

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S3-P7

**A SOLVATOCHROMIC METHOD FOR DETERMINING THE ELECTRIC POLARIZABILITIES IN THE EXCITED ELECTRONIC STATES OF MOLECULES**

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**Abstract:**

The dispersive interactions can be evidenced in non-polar solutions in which the strength of other universal interactions is comparatively very small. The electronic absorption spectra of some benzene derivatives in non-polar solvents are analyzed from the solvatochromic point of view and the spectral shifts are correlated with dispersion function of the solvents. The electric polarizabilities in the excited states of the spectrally active molecules were estimated using the obtained dependence. The importance of this study derives from the fact that very restrictive methods (computational methods) can be used to estimate these parameters.

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S3-P8

**A STUDY OF THE STRETCHING EFFECT ON THE ANISOTROPY OF POLYMER FOILS**

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**Abstract:**

The foils obtained from APV gel in which pyridazinium ylids at poor concentration were inserted have an initial anisotropy due to the flow orientation of the polymer gel. The foils were stretched after drying and the birefringence was measured for different degrees of stretching. The obtained results are analyzed and the structural peculiarities of each type of pyridazinium ylids are discussed.

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S3-P9

**CONSOLIDATION OF NANOCRYSTALLINE SUPERMALLOY MECHANICALLY  
ALLOYED POWDERS BY SPARK PLASMA SINTERING**

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**Abstract:**

The spark plasma sintering technology was used to produce nanocrystalline compacts from mechanically alloyed Supermalloy powders. An original set-up experiment was designed. The nanocrystalline Supermalloy (79Ni16Fe5Mo) powders with a typical crystallite size of 20 nm were obtained by mechanical alloying in argon atmosphere, after 20 h of milling. A compromise between high density of the compacts and their nanocrystalline state was pursued by controlling the applied pressure, sintering temperature and sintering time. The sintering temperatures in the range of 500-600 °C and a sintering time around 2 minutes were used to conserve the crystallite size under 35 nm, in order to have good soft magnetic properties. A relative density of 92% has been obtained. The structural and micro-structural properties were studied by X-rays diffraction and scanning electron microscopy. The magnetic properties (coercive field and permeability) have been studied in correlation with sintering parameters.

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**S3-P10**

**SPECTROSCOPIC STUDY OF GAMMA IRRADIATED HIGH DENSITY POLYETHYLENE**

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**Abstract.**

In this paper, the absorption of  $\beta$  and  $\gamma$  radiation in high density polyethylene was studied, in order to determine the absorption coefficients of the half life thickness in these types of materials. With the help of these experimental data, the global  $\beta$  and  $\gamma$  radioactivity of some radioactive waste, packed in different plastic bags, coming from nuclear medicine departments, can be estimated.

Also, the  $\beta$  spectrometry with huge plastic scintillators was established, in order to evaluate the global activity of  $\beta$ -pure radioactive waste by using a calibration in energy with Compton electrons.

The  $\beta$  global measurements were performed over regions of interest ROI, established for each determined radioisotope. It also was demonstrated that the  $\gamma$  radiation has a weak attenuation in such materials, its dependence of the thickness being almost linear.

Also, in the present study, the effects of ionizing radiation of Co-60 from 79,5 to 3561 Gy, on some high density polyethylene characteristics were studied. Such an effect was evaluated using electron paramagnetic resonance (EPR) spectroscopy. Polyethylene EPR spectra were recorded and analyzed before and after irradiation and changes were explained in detail.

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**S3-P11**

**SPECTROPHOTOMETRIC ASSAY OF VISIBLE ABSORPTION BAND OF  
TRIPHENYLFORMAZAN DERIVATIVES IN BINARY SOLUTIONS**

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**Abstract**

Spectrophotometric methods are very useful techniques for the interpretation of the intermolecular interactions occurring in solutions between the solute molecules and the solvent ones, based on mathematical models. The interest for the study of triphenyl formazans is primarily due to their implications in oxido-reduction reactions and their use for analytical purposes. The contributions of the universal forces in binary solutions of four triphenylformazan derivatives were investigated in the frame of this study, by plotting the spectral shifts of the visible absorption band with the macroscopic physical parameters of the pure solvents. The experimental results revealed that the interactions of dispersion are the dominant ones in the binary solutions, the solvation energy in the excited state of the studied compounds being higher than that corresponding to the ground state.

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**S3-P12**

**INFRARED AND RAMAN PLATFORM FOR NON-CONTACT CHARACTERIZATION OF ART OBJECTS AT IFIN-HH**

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**Abstract:**

Radiation conservation of Cultural Heritage objects made from organic materials subjected to microbial and insect attacks has been successfully applied at IRASM Radiation Processing Centre. Radiation technologies have already been proven worldwide as a safe, non-toxic and efficient practice for the conservation and consolidation of art and cultural heritage objects. Starting as an analytical necessity for non-contact chemical and physical characterization methods for a particular artifact, IRASM's Physical and Chemical Tests Laboratory is currently testing and developing an infrared and Raman platform for chemical composition characterization before and after irradiation process.

Fourier transform vibrational spectroscopy is a wide spread analytical method within the museum art conservation laboratories, with an increasing scientific contribution to the organic material characterization in both art and archaeometry.

Wood, paper, leather, organic and anorganic pigments in oil paintings and other organic materials are currently tested for optimum acquisition parameters, creation of spectral databases for material identification, assessment of chemical degradation. The present paper is describing the current progress on method development with examples on art and cultural heritage objects.

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**S3-P13**

**NON-DESTRUCTIVE STUDY ON POLYCHROME WOOD CULTURAL HERITAGE BY X-RAY FLUORESCENCE SPECTROSCOPY**

CORNELIU CATALIN PONTA<sup>1</sup>, MARIA GEBĂ<sup>2</sup>, ANA MARIA VLAD<sup>2</sup>, DANIELA SALAJAN<sup>2</sup>

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**Abstract:**

A study aiming at the identification of the mineral pigments used on a lot of icons of XVIII -XX century detained by the "Moldova" National Complex of Museums was occasioned by the Project DELCROM. The non-destructive x-ray fluorescence spectroscopy was an adequate analysis method due to its non-destructibility. The analyses allowed the identification of many pigments traditionally used in icons painting, along with some modern ones. This study intended a characterization of painting materials, in order to determine the pigments behavior following a conservation treatment by gamma irradiation.

S3-P14

**THEORETICAL INVESTIGATION ON SOME PHYSICO-CHEMICAL PROPERTIES OF TWO ANTIBACTERIAL DRUGS**

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**Abstract.**

Two broad-spectrum antibacterial drugs - rifampin and chlortetracycline - were investigated using specialized software for molecular modeling that allows getting valuable information regarding the relationship between the chemical structure and the activity of these molecules of biomedical interest. The objective of this work was to generate the molecular structures of the two antibiotics, as well as to predict some physico-chemical properties and their UV-VIS spectra. The theoretical approach was carried out with HyperChem 8.0 computational package – PM3 semi-empirical method.

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S3-P15

**HUMAN PHOTORECEPTORS ORIENTATION**

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**Abstract:**

Non-vertebrate eyes have the photoreceptors pointed toward the light. The vertebrate eyes and the human eyes have the photoreceptors pointed backwards, facing away from the light. In this arrangement, the light first has to travel through blood vessels and several layers of retinal nerve cells. The inverted orientation of photoreceptors in human eye has therefore, long been regarded as an inferior arrangements. The paper presents a review of theories and explanations of human photoreceptors orientation

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S3-P16

**THE SCANNING ELECTRON MICROSCOPY (SEM) INVESTIGATIONS OF  
HYDROXYAPATITE COATINGS**

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**Abstract:**

The scanning electron microscope (SEM) uses a focused beam of high-energy electrons to generate a variety of signals at the surface of solid specimens. The signals that derive from electron-sample interactions reveal information about the sample including external morphology (texture), chemical composition, and crystalline structure and orientation of materials making up the sample. In most applications, data are collected over a selected area of the surface of the sample, and a 2-dimensional image is generated that displays spatial variations in these properties. In this work, the hydroxyapatite formation on the surface of titanium alloy is investigated by scanning electron microscopy (SEM). SEM studies confirm the formation of hydroxyapatite on the titanium substrate.

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Section 4. Technical Physics and Interdisciplinary.

S4-01

**SURFACE PROPERTIES OF EXCIMER LASER TREATED POLY (ETHYLENE TEREPHTHALATE) FILMS AT 248 NM AND 308 NM**

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**Abstract:**

The surface of poly (ethylene terephthalate) obtained by irradiation with two lasers in air at different pulse numbers, below and up-threshold fluences were studied and compared. The laser induced morphologies and chemical changes were evidenced by scanning electron microscopy (SEM) and contact angle, attenuated total reflectance – Fourier transform infrared spectroscopy (ATR-FTIR), X-ray photoelectron spectroscopy (XPS), respectively. Tree like structures were identified by SEM measurements on the irradiated area, for values up to the threshold fluence ( $50\text{mJ}/\text{cm}^2$ ) at 248 nm laser wavelength, while below threshold almost no change was evidenced. The morphology of the analog up-threshold fluence ( $283\text{mJ}/\text{cm}^2$ ) irradiated samples, seems to demonstrate that photon energy is the most important parameter that has a pronounced influence in the origin of cone structure formation. In both cases, the texturing of irradiated surface appears more clearly with the pulse number.

Chemical properties were also analyzed and a possible correlation between two laser wavelengths cases is discussed. From the XPS measurements result that O/C ratio decreases more significantly with pulse number for higher photon energy of the laser radiation. Moreover, for a certain fluence the chemical compositions are not influenced by the irradiation dose (pulses number) which means that the contact angle increases is due to surface roughness modification (the contact angle for untreated polymer is  $73^\circ$  while for a sample irradiated with 150 pulses at  $50\text{ mJ}/\text{cm}^2$  is approximately  $165^\circ$ ).

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S4-P1

APPLICATION OF UNIFAC GROUP CONTRIBUTION MODEL TO PREDICT THE ENTHALPY DATA FOR TOLUENE WITH SEVERAL ALKYL ETHANOATES BINARY MIXTURES AT 298, 15 K

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**Abstract:**

The experimental data of mixing properties for a set of four binary mixtures formed by toluene with several alkyl ethanoates (methyl to butyl) have been measured over the whole composition range and atmospheric pressure. The excess enthalpies,  $H_m^E$ , were measured at  $T = 298,15$  K for all systems, while the excess volumes,  $V_m^E$ , were obtained for the same set of systems but at two temperatures of 298,15 and 318,15 K. This binary systems present a different behaviour. The  $V_m^E$  are negative for all system except for those mixtures containing methyl ethanoates, which present  $V_m^E > 0$ . The temperature effect on  $V_m^E$  is analysed. All experimental values are correlated with a new suitable parametric equation, which is function of the so-called active fraction. The UNIFAC model is applied to all the mixtures to estimate the  $H_m^E$  considering two versions, being necessary to recalculate the interaction parameters corresponding to carboxylate/aromatic in the version of Dang and Tassios (*Ind. Eng. Chem. Des. Dev.*, 25, 22, 1986). The estimation for the elected mixtures is acceptable.

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S4-P2

A PROTOTYPE MINI HIGH GRADIENT MAGNETIC SEPARATOR DEVICE FOR BLOOD DETOXIFICATION. *IN VITRO* CHARACTERIZATION.

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**Abstract:**

In this work a prototype mini magnetic filter device is characterized using blood mimic fluid (ethylene glycol-water solution). The portable magnetic filter is designed for ex-vivo magnetic separation of blood borne magnetic nano-/micro-spheres for human detoxification purpose. The filter consists of an array of alternating fine ferromagnetic wires and fine biocompatible tubes, which is immersed in an externally applied magnetic field. The wires are magnetized and the high magnetic field gradients from the magnetized wires help the collection of magnetic spheres from blood flow in the tubes. Magnetic filtration at various applied magnetic field strengths and various flow rates showed that the device could efficiently separate magnetic spheres from blood mimic fluids at moderate applied magnetic field and relatively high flow rates. The experiments also showed that the device had a relatively high capacity for sphere retention. All the results revealed that the filter could be a clinically applicable device for efficient filtration of magnetic spheres from blood flow for human detoxification purpose.

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S4-P3

**IN VITRO UTILIZATION OF SUPERPARAMAGNETIC NANOPARTICLES IN  
HEMODIALYSIS THERAPY**

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**Abstract:**

The *in vitro* utilization of biocompatible ferromagnetic nanoparticles (BFNs) in hemodialysis (HD) is introduced in this work. The proposed strategy is termed magnetically assisted hemodialysis (MAHD) and it aims to become a more efficient development of conventional HD. The method is based on the production of biocompatible ferromagnetic nanoparticles–targeted binding substances conjugates (BFNs–TBSs Cs) constructed of BFNs and specifically designed TBSs that should have high affinity and binding capacity for target toxic substances (TTSs) which must be removed from the end stage renal disease patientS subjected to HD. Antibodies or even specific proteins could serve as the TBS of the desired BFNs–TBSs Cs. The BFNs–TBSs Cs should be administered to the patient timely *prior* to the MAHD session so as to bind with the desired TTSs during their free circulation in the vascular network. Eventually, the complete BFNs–TBSs–TTSs structure can be selectively removed during the MAHD session by means of an external magnetic filter that is attached either at the dialyzer or at other collection point(s) along the blood circulation line of the dialysis machine. The advantages of MAHD over conventional HD regarding the patient’s comfort and overall health status are discussed in detail among practical issues.

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S4-P4

**THE INFLUENCE OF THE SPUTTERING POWER DENSITY ON THE  
MICROSTRUCTURE AND MAGNETIC PROPERTIES OF COFESIB THIN FILMS**

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**Abstract:**

CoFeSiB materials have been studied extensively both theoretically and as active components for various magnetic devices. Recently, the use of CoFeSiB amorphous thin films was proposed as an alternative to the conventional CoFe crystalline films in magnetic tunnel junction (MTJ) structures for magnetic random access memory (MRAM), since amorphous CoFeSiB provides better magnetic properties than CoFe [1]. By changing the deposition parameters, such as temperature, composition, thickness and, especially, the sputtering power density, it is possible to control the phase formation, texture and grain sizes, and thus to optimize the magnetic properties [2,3]. In this paper we report some results concerning the sputtering power density on the microstructure and magnetic properties of CoFeSiB thin films.

Co<sub>76</sub>Fe<sub>3</sub>Si<sub>10</sub>B<sub>11</sub> thin films with thicknesses of 160 nm were fabricated by RF magnetron sputtering deposition on glass substrates, at room temperature, under different sputtering power densities. The roughness of the thin films and their microstructure were investigated by using atomic force microscopy (AFM) and X-ray diffraction (XRD), respectively. When the sputtering power density is not very high (1.2 W/cm<sup>2</sup>), the incident kinetic energy of atoms sputtered onto the substrate is relatively low, leading to low surface transfer rates. Thus, the film can easily present a 3D growth mode, resulting in relatively high surface roughness. Once the sputtering power density (7 W/cm<sup>2</sup>) is increased the roughness decreases and the amount of islands increases significantly onto the surface of the substrate. CoFeSiB thin films are amorphous when deposited at low sputtering power densities, and once the sputtering power density increases a mixture of crystalline and amorphous phases is observed in the as-deposited state. The films prepared at the lowest sputtering power density 1.2 W/cm<sup>2</sup>, exhibited a coercivity H<sub>c</sub>=65 Oe and a saturation magnetization M<sub>s</sub>=110 emu/g, but when the films were sputtered at 7 W/cm<sup>2</sup> power density, they showed same coercivity and an improvement of M<sub>s</sub>=189 emu/g.

*Support from the Romanian Nucleu Programme (Project PN 09-43 01 02) is highly acknowledged.*

**References**

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  - [2] S.R. Kappaganthu, Y. Sun, Surface & Coatings Technology 198 (2005) 59–63.
  - [3] Sam Zhang et al., Diamond & Related Materials 13 (2004) 1777–1784.
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S4-P5

**APPLICATIONS OF MAGNETIC NANOPARTICLES IN HYPERTHERMIA TREATMENTS**

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**Abstract:**

Standard treatments of cancer diseases are surgery, irradiation and chemotherapy, or combinations of them, dependent on the patient and the specific tumour. Hyperthermia (HT, thermal therapy) is one of the cancer therapies and is considered to be an artificial way of increasing the body tissue temperature by delivering heat obtained from external sources to destroy cancerous cells or prevent their further growth. Among a multitude of alternative therapy concepts, hyperthermia is proven to have synergistic effects with standard treatments, but even hyperthermia treatment alone may damage tumour tissue. Besides whole body hyperthermia (which is used for patients with metastatic disease), there are different ways of achieving local intracorporeal heat generation, e.g. by means of microwave radiation, by capacitive or inductive coupling of radiofrequency fields, via implanted electrodes, by ultrasound, or by lasers. As an alternative therapy method, in magnetic particle hyperthermia (MPH) one deposits magnetic media in tumour tissue with subsequent heating by means of an external alternating magnetic field. Former approaches dealt with electroconductive or ferromagnetic implants; recent studies are applying MNP as their heat generation potential appears beneficial and they provide the opportunity of direct tumour targeting through blood circulation. Besides a localized heat generation, the application of MNP offers the possibility of a self-limitation of the temperature enhancement by using a magnetic material with a suitable Curie temperature. The aim of this paper is to present the physical principles and the basic concepts of the hyperthermia treatments using the magnetic nanoparticles.

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S4-P6

**SQUID APPLICATIONS IN BIOMAGNETISM**

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**Abstract:**

The paper presents a SQUID installation designed for biomagnetism studies. The installation consists of a shielded room made from nonferromagnetic materials and a Helmholtz rectangular triaxial system surrounding the room. The Helmholtz system realizes the dynamic control and compensation of the natural geomagnetic perturbations and the electromagnetic fields produced by the human activity. The magnetic fields generated by the bioelectromagnetic activity of the living organisms have very low values. To detect such fields it is necessary a proper electromagnetic environment and a magnetic high resolution investigation device. This environment can be obtained by several methods: magnetic shielding against the surrounding environment, utilization of installations with coil systems to control the level of external magnetic noise and combined systems consisting of screened rooms, made of ferro- or non-ferromagnetic materials, together with systems for the compensation and control of the external magnetic field. In order to obtain the magnetic shielding efficiency, combined installations are used, consisting of a shielded room and a system for external magnetic field compensation and control. The technical solutions and the performances of this installation are presented.

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S4-P7

**STUDY FOR THE LOCATION OF A BIOELECTROMAGNETIC RESEARCH**

**LABORATORY**

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**Abstract:**

This work presents the results of the determination of the electromagnetic and magnetic field levels with the view to establish a laboratory for bioelectromagnetism researches. The measurements were carried out within a perimeter around the headquarters of the Faculty of Medical Bioengineering of Iasi, inside it and in the room destined to this laboratory. The measurements carried out concerned both the fields created by the human activity and the natural field levels. We used electromagnetic field analyzing equipment with radio frequency Horn antenna for artificial electromagnetic fields measurements, and alternative field magnetometers for low frequencies measurements. The levels of the electromagnetic fields generated by high frequency sources were measured, the sources of low frequency disturbances were identified, and the extent of the influence of metallic reinforcements from the building structure on the magnetic field configuration in the laboratory was determined. In this laboratory a SQUID type installation used for the biofields measurement is meant to operate. The electromagnetic biocompatibility between the SQUID equipment and the electromagnetic environment is provided by using a large size shielded room with non-ferromagnetic walls.

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S4-P8

**EXPERIMENTAL INVESTIGATIONS FOCUSED ON PLANT ORGANISMS  
RESPONSE TO THE ACTION OF IONIZING RADIATIONS**

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**Abstract:**

Physiological and biochemical processes in plants are significantly affected by X-ray irradiation stress. The irradiation of seeds with high doses of X- rays is known to disturb the synthesis of protein, hormone balance, leaf gas-exchange, water exchange and enzyme. The morphological, structural and the functional changes depend on the strength and the duration of the X- irradiation stress. In the case of moderate stress, the adaptability capacity of the plants is preserved and the observed changes are reversible.

The influence of X-ray exposed corn seeds on the biosynthesis of chlorophylls were investigated by spectral measurements in visible range of electromagnetic radiation. The experimental data that were obtained indicated that the plant response after exposure to ionizing radiation is consistent with slight stimulation of biosynthesis of pigments, especially for low-dose radiation with a tendency to inhibit their synthesis as irradiation time increased. It was also noticed that for a low dose (50cGy) administrated 10 minutes before a high dose (200cGy) both pigment biosynthesis and the mass of green substance were stimulated, which can be explained by the adaptative response of living organisms to low doses of radiation.

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S4-P9

**WOOD DRYING IN ELECTROMAGNETIC FIELD**

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**Abstract.**

This study presents the influence that the microwave field with cold air stream has on a wood structure. Our study combines the experimental results with numerical modelling in the behalf of finding out the appropriate formula between the applied energy and the material properties. There is a relation between the thermal properties of the wood and the required heat and energy to achieve the drying temperature. The water from wood must be removed to some degree to make the wood usable. This paper discusses the interaction of water and wood and the drying process of wood in high frequency electromagnetic field.

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**S4-P10**

**EXPERIMENTAL SIMULATION OF THE IMPACT OF ELECTROMAGNETIC  
POLLUTION AND MAGNETIC CONTAMINATION ON PLANTS**

CORINA ASTEFANOAEI, MANUELA URSACHE, DORINA CREANGA, FLORIN TUFESCU  
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**Abstract:**

The electromagnetic pollution biological impact represents an actual scientific and practical issue because of nowadays wide utilization of electromagnetic energy - while the interest in the concept of nanotoxicity is rapidly developing due to the numerous nanotechnological activities in industrial and biotechnological centers. Some effects of low power microwave exposure as well as of magnetic nanoparticle administration were studied based on the laboratory simulation of electromagnetic exposure and nanoparticle impact on the young seedlings of sunflower. Electromagnetic exposure was assured using a hand made installation able to generate low power microwaves; magnetic contamination was practically simulated by using magnetite colloidal suspension in deionized water (an aqueous ferrofluid). The spectrophotometric assay of chlorophylls and carotenes resulted in numerical values of the concentrations of chlorophyll a, chlorophyll b and carotene like pigments in the green tissue of sunflower seedlings. The changes recorded in comparison to the control plants were discussed based on photosynthesis process molecular features. The influences evidenced in the levels of DNA and RNA was discussed in the terms of genotoxicity.

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**S4-P11**

**THE EFFECT OF MICROWAVES EXPOSURE MAGNETITE NANOPARTICLES  
ADMINISTRATION ON SUN LOWER YOUNG SEEDLINGS**

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**Abstract**

The electromagnetic pollution biological impact represents an actual scientific and practical issue because of nowadays wide utilization of electromagnetic energy - while the interest in the concept of nanotoxicity is rapidly developing due to the numerous nanotechnological activities in industrial and biotechnological centers. Some effects of low power microwave exposure as well as of magnetic nanoparticle administration were studied based on the laboratory simulation of electromagnetic exposure and nanoparticle impact on the young seedlings of sunflower. Electromagnetic exposure was assured using a hand made installation able to generate low power microwaves; magnetic contamination was practically simulated by using magnetite colloidal suspension in deionized water (an aqueous ferrofluid). The spectrophotometric assay of chlorophylls and carotenes resulted in numerical values of the concentrations of chlorophyll a, chlorophyll b and carotene like pigments in the green tissue of sunflower seedlings. The changes recorded in comparison to the control plants were discussed based on photosynthesis process molecular features. The influences evidenced in the levels of DNA and RNA was discussed in the terms of genotoxicity.

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**S4-P12**

**ELECTROCHEMICAL IMPEDANCE SPECTROSCOPY INVESTIGATION OF PLASMA  
NITRIDED AUSTENITIC STAINLESS STEEL**

S. IACOB STRUGARU<sup>1</sup>, C. MUNTEANU<sup>1</sup>, R. TARNAUCEANU<sup>1</sup> and D. MARECI<sup>2</sup>

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**Abstract:**

Austenitic stainless steel has good corrosion resistance, but their low hardness limit use whenever surface hardness is required. Plasma nitriding is a well established technique for steel hardening that can also be applied to this kind of steels with the aim of enhancing its hardness. Austenitic stainless steel sample was plasma nitrided at a temperature of 530°C for 14 hours. Electrochemical corrosion studies were carried out with disk electrodes of nitrided austenitic stainless steel in phosphate solution at pH 6.0, using electrochemical impedance spectroscopy (EIS) technique, comparing the results with those for untreated austenitic stainless steel. The EIS technique was applied to study the nature of the passive film formed on untreated and nitrided austenitic stainless steel samples in phosphate solution, at open circuit potential.

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**S4-P13**

**MICROWAVES THERMOGRAPHY VS. INFRARED THERMOGRAPHY**

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**Abstract**

The paper presents some recent advances concerning a non-invasive microwave method used to investigate living structures. An overview of the main investigation methods in breast cancer are presented, as well as their classification. Thermography as an early non-invasive and highly sensitive method helps on the detection of the malign tumors in the early curable stages, contributing to diminish the mortality which appears in the cases where the breast cancer was detected in tardive incurable stages. It is a non-invasive investigation method for the living structure which uses the radiation emitted by the biological structures themselves within the microwave range, according to the radiation laws of electromagnetic waves.

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S4-P14

**FTIR STUDIES REGARDING THE MODEL MEMBRANES FLUIDITY**

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**Abstract:**

Thermal changes induced in model membranes fluidity were studied by FTIR techniques. The main phase transition temperature at which the bi-layers of DPPC or DPPG contain equal percentages of ordered and disordered zones of phospholipids is determined by spectral means and it is considered as an indicator of the membrane fluidity.

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S4-P15

**SIMULATIONAL STUDY OF THE YIG FILMS IN THE FREQUENCY RANGE  
OF 18 - 27 GHZ**

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**Abstract:**

The magnetic domain structure of the YIG film reorganizes at magnetic field application, allowing for a continuously tunable negative permeability. This property is important for applications like tunable NIMs (negative-refraction structures), working in microwave field. The magnetic permeability of the YIG films was determined by structural simulation methods, in the 18-27 GHz range, where the NIMs structures were developed (He, Dae *et al.*). Samples were simulated inside a rectangular waveguide and the induced microwave magnetic field is opposite to the field excited in a TE<sub>10</sub> mode of propagation in the waveguide. The HFSS (Ansoft Technologies) program was used, and also its eigenmode module for material resonances determinations. Resonances signification was commented in the context, using a structural explanation and linked by the material interaction with the exciting field. Results are available for the NIMs structure optimization and improving their tunable properties in microwave range.

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## The 4-th National Conference of Applied Physics

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## The 4-th National Conference of Applied Physics

Iasi, Romania

November 19 - 20, 2010

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## Atractii turistice

### Rezervatia Dealul Repedea

Situata la 9 Km de Iasi, a fost infiintata in 1953, fiind prima rezervatie geologica din tara, Zona rezervatiei este de fapt o portiune din fundul Marii Sarmatice ce a existat acum 20 milioane de ani, dovada fiind fauna fosila din rocile calcaroase de aici.

### Gradina Botanica

Prima Gradina Botanica din Iasi a fost infiintata in 1856 de medicul si naturalistul Anastasie Fatu. Actuala Gradina Botanica a fost infiintata aproximativ un secol mai tirziu, in 1963. Un loc favorit al vizitatorilor il reprezinta rozariul, unde sunt peste 800 de specii de trandafiri din diferite zone ale globului.

### Manastirea Cetatuia

Manastirea Cetatuia este una din cele mai frumoase opere de arta bisericeasca din Moldova. A fost ctitorita de Duca Voda intre 1668-1672. Aici a functionat o cunoscuta tiparnita cu litere grecesti, adusa de la Venetia, in care au fost tiparite multe carti pentru crestinii din Orient.

### Teatrul National "Vasile Alecsandri"

Teatrul a fost inaugurat in 1896, fiind una din cele mai frumoase cladiri de acest gen din tara. Uzina electrica a teatrului, pusa in functiune o data cu deschiderea teatrului, a reprezentat inceputul iluminatului electric la Iasi. Aici pot fi admirate opere de arta cum sunt: candelabru din cristal de Venetia sau plafonul pictat de Al. Goltz.

### Palatul Culturii

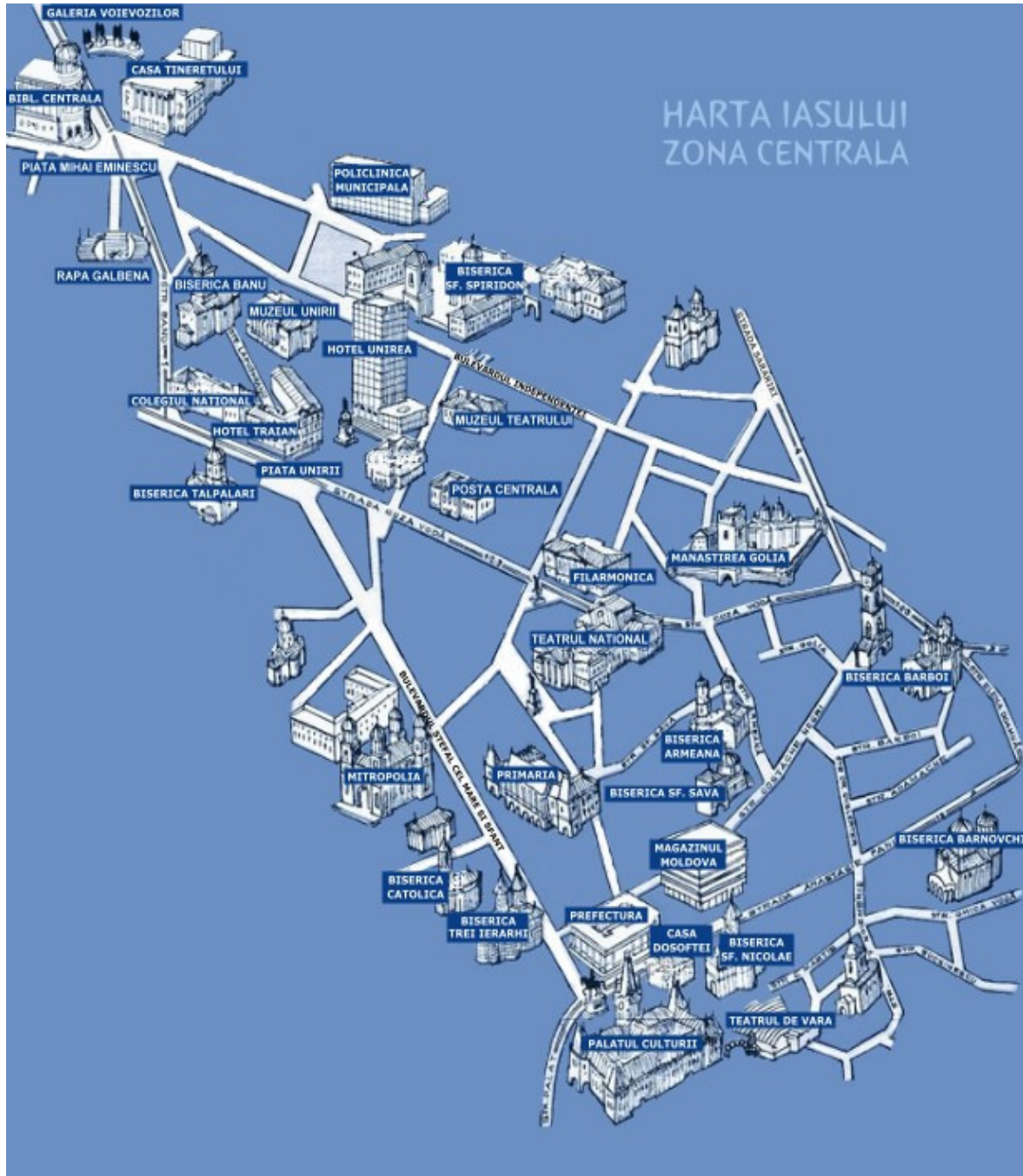
Lucrarile de constructie au inceput in 1906 iar inaugurarea a avut loc in 1926, in prezenta regelui Ferdinand al Romaniei. Putem admira orologiul, format dintr-un ansamblu de opt clopote ce reproduc, din ora in ora, Hora Unirii sau celebrele sali, Sala Voievozilor si Sala Gotica. Impresionanta cladire este astazi sediul Muzeului de Istorie a Moldovei, Muzeului Etnografic, Muzeului de Arta si al Muzeului Stiintei si Tehnici.

### Casa Memoriala Vasile Pogor

Cladirea este monument de arhitectura si a fost construita de vornicul V. Pogor, intre 1855-1858. A fost locuinta acestuia si apoi sediul Societatii Junimea si al revistei "Convorbiri Literare". In aceasta casa, Titu Maiorescu a citit, in 1870, pentru prima oara poezia "Venere si Madona" a lui Mihai Eminescu, necunoscut la acea vreme. In aceasta cladire se afla azi Muzeul Literaturii Ramane.

### Biserica "Sf. Nicolae Domnesc"

Biserica initiala s-a construit in timpul lui Stefan cel Mare, intre 1481-1482. Fiind puternic avariata in urma unor incendii, a fost reconstruita din temelii intre 1888-1904. A fost Catedrala Mitropolitana pina la sfirsitul sec. al XVII –lea si aici au fost unsi aproape toti domnii Moldovei.





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