

# Table of Contents

## Preface and Committees

## Chapter 1: Solid-State Physics and Related Technologies

### Laser-Induced Formation of Periodic Structures on the Metal Surfaces and Surface Plasmons Excitation

I. Dmitruk, N. Zubrilin, N. Berezovska, O. Dombrovskiy, S. Balanets, E. Grabovsky and I. Blonskiy 3

### Laser-Induced Nano-Structuring of Semiconductors and Metals in near Surface Layers by Nanosecond Pulses

L. Fedorenko and A. Medvid 9

### Laser-Induced Modification of Properties of CdZnTe Crystals

V.A. Gnatyuk, O.I. Vlasenko, S.N. Levytskyi and T. Aoki 15

### Enhancement of Resistivity of CdZnTe Crystal by Laser Radiation

A. Medvid, A. Mychko and E. Dauksta 19

### Increase of Photoelectric Response of Ge Nanocones Formed on SiGe by Laser Radiation

A. Gorb, O. Korotchenkov, V. Kuryliuk, A. Medvid, A. Nadtochiy and A. Podolian 23

### On the Structure of Atomic Clusters: Selection of Calculation Methods to Match Mass Spectra

A. Dmytruk 26

### Production of Carbonaceous Molecules by the Impact Reaction in Nitrogen Gas by Use of a Gas-Gun

T. Mieno, K. Ookouchi, K. Kondo, S. Hasegawa and K. Kurosawa 31

### Adsorption of Pyrrole on the Si(111)-7×7 Surface: Effect of Substrate Temperature

M. Shimomura and K. Ota 35

### Total Absorption Based on Smooth Double-Turn Helices

I.A. Faniayeu, I.V. Semchenko, S.A. Khakhomov and T. Dziarzhauskaya 39

### Optical Characterization and Quality Control Methods of Thin Ferroelectric Films

B.V. Karlenko, O.V. Makarenko, L.V. Poperenko and T. Aoki 44

### Synthesis of Chlorine-Silicate Phosphors for White Light-Emitting Diodes

M.V. Keskinova, K.A. Ogurtsov, M.M. Sychoy, E.V. Kolobkova, I.A. Turkin, Y. Nakanishi and K. Hara 48

### Piezoresistivity and Electrical Resistance Relaxation of Polyisoprene Nanostructured Carbon Allotrope Hybrid Composites

A. Linarts and M. Knite 52

### Nonlinear Properties of Soft Ferrites

A. Gulbis, D. Malinovska and D. Stepins 56

### Optical Trapping and Manipulation of Polymer Spheres and HeLa Cell Organelles

A. Statsenko, G. Ito, W. Inami, Y. Kawata and L. Poperenko 60

### Terahertz Spectroscopy Studies of Solid-State Salicylic Acid

K. Zelenska, H. Kimura, T. Sasaki, T. Aoki and V. Gnatyuk 65

### Photon Beam Transmission Through Microstructures

R. Jablonski and A. Al Tabich 69

### Improvement of CdS Thin Films Optical Properties and Crystallinity by Laser Radiation

A. Medvid, P. Onufrijevs, E. Dauksta, R. Janeliukstis, J.L. Plaza, S. Rubio, E. Diéguez, N. Berezovska and I. Dmitruk 74

### Tunneling Transport in Quantum Dots Formed by Coupled Dopant Atoms

D. Moraru, A. Samanta, T. Tsutaya, Y. Takasu, T. Mizuno and M. Tabe 78

### Kelvin Probe Force Microscope Observation of Donors' Arrangement in Si Transistor Channel

K. Tyszka, D. Moraru, T. Mizuno, R. Jabłoński and M. Tabe 82

### Study on Phonon Drag Effect and Phonon Transport in Thin Si-on-Insulator Layers

H. Ikeda, T. Oda, Y. Suzuki, Y. Kamakura and F. Salleh 86

|                                                                                                                                                                                                                                       |     |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| <b>Holographic Photosensitivity Intensity Dependence of Azobenzene Molecular and Chalcogenide Glassy Films</b>                                                                                                                        |     |
| P. Augustovs, A. Ozols, E. Zarins and V. Kokars                                                                                                                                                                                       | 90  |
| <b>Seebeck Coefficient of Ge-on-Insulator Layers Fabricated by Direct Wafer Bonding Process</b>                                                                                                                                       |     |
| V. Manimuthu, S. Yoshida, Y. Suzuki, F. Salleh, M. Arivanandhan, Y. Kamakura, Y. Hayakawa and H. Ikeda                                                                                                                                | 94  |
| <b>Dye-Sensitized Solar Cells Based on ZnO Nanorods Array</b>                                                                                                                                                                         |     |
| R. Winantyo, D. Hartanto and K. Murakami                                                                                                                                                                                              | 98  |
| <b>Photoluminescence Spectra of CdTe Single Crystals Subjected to Nanosecond Laser Irradiation</b>                                                                                                                                    |     |
| D. Gnatyuk, T. Ito and T. Aoki                                                                                                                                                                                                        | 102 |
| <b>Materials and Photosensor Devices with High Radiation Stability</b>                                                                                                                                                                |     |
| I. Rarenko, D. Korbutyak, V. Koshkin, B. Danilchenko, L. Kosyachenko, P. Fochuk, V. Sklyarchuk, Z. Zakharuk, S. Dremlyuzhenko, A. Rarenko, Y. Nikonyuk, V. Klad'ko, L. Demchyna, S. Budzulyak, N. Vakhnyak, A. Medvid' and E. Dauksta | 107 |
| <b>Increase of Solar Cell Efficiency in Graded Band Gap Structure</b>                                                                                                                                                                 |     |
| J. Kaupužs and A. Medvid'                                                                                                                                                                                                             | 114 |
| <b>Recent Progress of GaP THz Signal Generator - Light Source for High Accurate Terahertz Spectrometer</b>                                                                                                                            |     |
| T. Sasaki, T. Tanabe and J. Nishizawa                                                                                                                                                                                                 | 118 |
| <b>Helical Metamaterial Elements as RLC Circuit</b>                                                                                                                                                                                   |     |
| T. Dziarzhauskaya, I. Semchenko and S. Khakhomov                                                                                                                                                                                      | 122 |
| <b>Modelling of Heat Exchange in Counterflow Shell-Type System</b>                                                                                                                                                                    |     |
| A. Jakovics, S. Gendelis, A. Laizans and D. Vardanjans                                                                                                                                                                                | 126 |
| <b>Simulation of Basic, Protein-Based Logic Gates</b>                                                                                                                                                                                 |     |
| B. Rakos and I. Nagy                                                                                                                                                                                                                  | 132 |

## Chapter 2: Chemical Materials and Chemical Technologies

|                                                                                                                              |     |
|------------------------------------------------------------------------------------------------------------------------------|-----|
| <b>Synthesis and Characterization of Nb-Doped TiO<sub>2</sub> Thin Films Prepared by RF Magnetron Sputtering</b>             |     |
| M. Dobromir, R.P. Apetrei, A.V. Rogachev, D.L. Kovalenko and D. Luca                                                         | 139 |
| <b>Influence of Substrate Preparation Method on the Morphologies of TiO<sub>2</sub> Sol-Gel Derived Coatings</b>             |     |
| G. Mezinskis, D. Larionova, A. Pludons and L. Grase                                                                          | 143 |
| <b>Acid-Base (Donor-Acceptor) Properties of Solids and Relations with Functional Properties</b>                              |     |
| M.M. Sychoy, S.V. Mjakin, A.I. Ponyaev and V.V. Belyaev                                                                      | 147 |
| <b>Chemically Treated Submicron Illite Clays for Product with Improved Strength</b>                                          |     |
| L. Grase, G. Mezinskis and I. Vitina                                                                                         | 152 |
| <b>Vacuum-Plasma Synthesis of Functional Coatings Using Targets Obtained by the Sol-Gel Method</b>                           |     |
| A.V. Rogachev, D.L. Kovalenko, V. Gaishun, D.L. Gorbachev, V.V. Vaskevich, M. Dobromir, D. Luca and A.S. Chirtsov            | 156 |
| <b>Formation of Negatively Charged AgI Colloid Nanoparticles by Condensation</b>                                             |     |
| D. Kalnina, K.A. Gross, A. Medvids and P. Onufrijevs                                                                         | 159 |
| <b>Sol-Gel Synthesis of Functional Nanostructured Materials for Electronic Devices</b>                                       |     |
| A. Rogachev, D. Luca, V. Gaishun, A. Semchenko, V. Sidsky, O. Tyulenкова and D. Kovalenko                                    | 164 |
| <b>Growth Time Effect on the Structural and Sub-Structural Properties of Chemically-Deposited ZnO Films</b>                  |     |
| T.O. Berestok, D.I. Kurbatov, A.S. Opanasyuk, A. Cabot and H.S. Cheong                                                       | 168 |
| <b>Ethylene Vinyl Acetate Copolymer and Nanographite Hybrid Composite as Innovative Material for Chemical Vapour Sensing</b> |     |
| S. Stepina, G. Sakale and M. Knite                                                                                           | 179 |
| <b>Chemical Bath Deposition of SnS Thin Films from the Solutions with Different Concentrations of Tin and Sulphur</b>        |     |
| M. Safonova, E. Mellikov, V. Mikli, K. Kerm, N. Revathi and O. Volobujeva                                                    | 183 |
| <b>Increase of Electrical Conductivity due to Chemical Reduction of Pre-Exfoliated Graphene Oxide by Sodium Borohydride</b>  |     |
| A. Berzina, V. Tupureina, R. Orlovs, D. Saharovs, J. Bitenieks and M. Knite                                                  | 187 |

## **Chapter 3: Materials and Technologies in Biomedicine and Environmental Engineering**

|                                                                                                                                                                                          |     |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| <b>Towards Biotechnological Processing of Calcium Phosphates</b><br>K. Gross                                                                                                             | 193 |
| <b>Formation of Calcium-Deficient Hydroxyapatite via Hydrolysis of Nano-Sized Pure <math>\alpha</math>-Tricalcium Phosphate</b><br>L. Vecbiskena, K. Gross, U. Riekstina and C.K.T. Yang | 201 |
| <b>Preparation of F-Doped Hydroxyapatite via Wet-Chemical Precipitation Technique Combined with pH-Cycling</b><br>V. Zalite, K. Kostrjukova and J. Locs                                  | 205 |
| <b>Hydrothermally Synthesized Strontium Peroxyapatite</b><br>A. Osīte, K.A. Gross, A. Viksna and R. Poplauskis                                                                           | 209 |
| <b>Antimicrobial Properties of the Modified Cotton Textiles by the Sol-Gel Technology</b><br>S. Vihodceva, S. Kukle and O. Mutter                                                        | 213 |

## **Chapter 4: Fibers and Fabric**

|                                                                                                                          |     |
|--------------------------------------------------------------------------------------------------------------------------|-----|
| <b>The Flame Retardant Coating of Linen Fabrics</b><br>A. Bernava and G. Strazds                                         | 219 |
| <b>The New Type of Knitted Resistive Fabric and its Application</b><br>A. Oks, A. Katashev and J. Litvak                 | 223 |
| <b>The Development of Hemp Fibre Nonwovens</b><br>U. Iljina, I. Baltina and S. Russell                                   | 227 |
| <b>Study of Mechanical Properties of Natural and Hybrid Yarns Reinforcements</b><br>A. Bernava, M. Manins and G. Strazds | 231 |
| <b>Development of Textile Based Sewn Switches for Smart Textile</b><br>I. Šahta, A. Vališevskis, I. Baltina and S. Ozola | 235 |

## **Chapter 5: Control and Automation**

|                                                                                                                                                           |     |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| <b>Control of Uncertain Systems: A Combined Approach</b><br>T.A. Várkonyi, J.K. Tar, A.R. Várkonyi-Kóczy and I.J. Rudas                                   | 241 |
| <b>Anytime Reactive Planning with Decision Automation</b><br>I. Komlósi                                                                                   | 245 |
| <b>Telemetric System for Automobile Engine Moving Parts at High Engine Speeds</b><br>A. Ishibashi, S. Katsuta, M. Nakamura and H. Muramatsu               | 249 |
| <b>On one Regularizing Algorithm for Comprehensive Diagnosing of Apparatus, Engines and Machinery</b><br>S.E. Guseynov, J.V. Aleksejeva and S.A. Andreyev | 254 |

## **Chapter 6: Signal and Data Processing, Computational Procedures**

|                                                                                                                                            |     |
|--------------------------------------------------------------------------------------------------------------------------------------------|-----|
| <b>A Hybrid Fuzzy-RBFN Filter for Data Classification</b><br>B. Tusor and A.R. Várkonyi-Kóczy                                              | 261 |
| <b>Construction of Anytime Algorithms for Robust Speech Recognition</b><br>G. Nagy                                                         | 265 |
| <b>Anytime Fuzzy Supervisory System for Signal Auto-Healing</b><br>A. Dineva, A.R. Várkonyi-Kóczy and J.K. Tar                             | 269 |
| <b>Patient-Specific Statistics-Based Decision Support in Health Monitoring Using Fuzzy Logic</b><br>E. Tóth-Laufer and A.R. Várkonyi-Kóczy | 273 |
| <b>Development of an <i>In Situ</i> Tool Wear Monitoring System Using the Cutting Sound</b><br>H. Takahashi, K. Sakai and H. Shizuka       | 277 |

## **Chapter 7: Applied Information Technologies**

|                                                                                                                                         |     |
|-----------------------------------------------------------------------------------------------------------------------------------------|-----|
| <b>Usage of 3D Anthropometric Data in CAD/CAM Individual Measurement List</b><br>I. Dāboliņa, A. Viļumsone, J. Dāboliņš and D. Beļakova | 283 |
| <b>Intelligent Knowledge Assessment for CAD/CAM Systems</b><br>J. Dāboliņš and J. Grundspeņķis                                          | 287 |
| <b>The Architecture of High-Capacity Storage Systems</b><br>K. Tibenszkyné Főrika                                                       | 291 |

## **Chapter 8: Product Design and Engineering Management**

|                                                                                                                                         |     |
|-----------------------------------------------------------------------------------------------------------------------------------------|-----|
| <b>Evaluation of Thermal Resistance of the Military Sleeping Bags</b><br>I. Abele, I. Sitvjenkins, K. Kuklane and A. Vilumsone          | 299 |
| <b>Work Measurement, Identification and Control</b><br>D. Belakova and I. Ziemele                                                       | 303 |
| <b>Analysis of the Effectiveness of the FIT (Feed-In Tariff) Mechanism</b><br>S. Matsuda and H. Kubota                                  | 307 |
| <b>Investigation of one Macro-Level Model of Distribution Logistics</b><br>S.E. Guseynov, A.N. Medvedev, R. Guseinovs and L.V. Baranova | 311 |
| <b>Evaluation of Camouflage</b><br>I. Abele, I. Sitvjenkins, I. Ziemele, I. Pazane and A. Vilumsone                                     | 317 |
| <b>Nonwovens in the Automobile Interior</b><br>A. Seile and D. Beļakova                                                                 | 321 |