

Table of Contents

Preface

Chapter 1: Physical Properties and Technologies for the Production of Nanolayers, Nanostructures and Heterostructures

Transport Properties of CaSi_2 and Ca_2Si Thin Films

L. Dermenji, K.G. Lisunov, K.N. Galkin, D.L. Goroshko, E.A. Chusovitin, N.G. Galkin and E. Arushanov 3

Formation of Fe_2Si Wetting Coating on $\text{Si}(001) 2\times 1$ and Growth of a Stable Fe Nanolayer: AES and EELS Study

N.I. Plusnin, A.M. Maslov and V.M. Il'yashenko 9

Structural Heterogeneity of an Amorphous Nanocrystalline Alloy in the Nanometer Range

A.M. Frolov, S.V. Dolzhikov and V.I. Belokon 15

Radiation Induced Defects in Hollow Particles of Zinc Oxide

A. Dudin and V.V. Neshchimenko 20

Size Effect on Optical Properties of Silicon Dioxide Hollow Particles

V. Iurina, V.V. Neshchimenko and C.D. Li 26

Investigation of the Mechanism of Electric Conductivity of Strontium Bismuthate $\text{Sr}_6\text{Bi}_2\text{O}_{11}$

D.S. Shtarev, A.V. Shtareva, A.V. Syuy and V.V. Likhtin 32

Relationship between the Photoluminescence Spectra and IR Spectroscopy of Mesoporous Silicon Samples during Long-Term Storage: The Effect of Immersion in an Aqueous LiBr Solutions

N.G. Galkin, D. Yan, K.N. Galkin and S. Chusovotina 38

Multilayer Heterostructures with Embedded CrSi_2 and $\beta\text{-FeSi}_2$ Nanocrystals on $\text{Si}(111)$ Substrate: From the Formation to Photoelectric Properties

N.G. Galkin, K.N. Galkin, E.Y. Subbotin, E.A. Chusovotin and D.L. Goroshko 45

Relationship between the Photoluminescence Spectra and IR Spectroscopy of Mesoporous Silicon Samples during Long-Term Storage: The Effect of Immersion in an Aqueous $\text{Fe}(\text{NO}_3)_3$ Solutions

N.G. Galkin, D. Yan, K.N. Galkin and S. Chusovotina 54

Influence of Structure-Phase State on Surface Morphology of FeSi_2 Nanofilms During RBE-MBE Growth on $\text{Si}(001) 2\times 1$

N.I. Plusnin 62

Theoretical and Experimental Studies of Structural Defects in CeO_2 Nanoparticles

M.A. Pugachevskii, A.N. Chibisov, A.P. Kuzmenko and A.S. Fedorov 68

Photocatalytic Reduction of CO_2 over Metal/BaTiO₃ Catalysts

S. Dubkov, A. Savitskiy, R. Ryazanov, V. Shatila, A.Y. Trifonov, A. Shkal, E. Kitsyuk, O. Shtyka, R. Ciesielski and D. Gromov 74

Effect of Process Temperature on the Growth Kinetic and Structure of Ge Nanowires Formed by Galvanostatic Electrodeposition Using in Nanoparticles

I. Gavrilin 80

Electrical Conductivity Study of the Adsorbate-Induced $\text{Si}(111)$ Surface Reconstructions after C_{60} Adsorption

D.A. Tsukanov and M.V. Ryzhkova 86

The Influence of Temperature on the Lateral Photovoltaic Effect in the $\text{Fe}_3\text{O}_4/\text{SiO}_2/\text{n-Si}$ Structure

T.A. Pisarenko, V.V. Korobtsov, V.V. Balashev and A.A. Dimitriev 92

The Features of the Lateral Photovoltaic Effect in the $\text{Fe}_3\text{O}_4/\text{SiO}_2/\text{n-Si}$ Structure Depending on Silicon Substrate Orientation

T.A. Pisarenko, V.V. Korobtsov, V.V. Balashev, A.A. Dimitriev and S.V. Bondarenko 98

Chapter 2: Laser Nanofabrication, Optical Materials, Meta- and Nanomaterials

Laser Printing of Chiral Silicon Nanoprotrusions by Asymmetric Donut-Shaped Femtosecond Pulses S.A. Syubaev, A.P. Porfirev and A.A. Kuchmizhak	107
Au Nanoparticle-Decorated TiO₂ Nanospheres Produced by Laser Reshaping in Water S.O. Gurbatov, S.A. Kulinich and A.A. Kuchmizhak	113
Photoluminescence and Features of the Defective Structure of Nominally Pure Lithium Niobate Crystals M. Smirnov, N.V. Sidorov, N.A. Teplyakova, M.N. Palatnikov and A.V. Syuy	121
Structural Features of Nominally Pure Lithium Niobate Crystals Grown from Boron-Doped Charge N.V. Sidorov, R. Titov, N.A. Teplyakova, M.N. Palatnikov and A.V. Syuy	128
Crystallization of Optically Thick Amorphous Silicon Films by Near-IR Femtosecond Laser Processing E. Mitsai, A.V. Dostovalov, K.A. Bronnikov, A.V. Nepomniaschiy, A.Y. Zhizhchenko and A.A. Kuchmizhak	134
Visualization of Optical Uniformity Alloyed Single Crystals of Lithium Niobate O. Pikoul, N.V. Sidorov, N.A. Teplyakova and M.N. Palatnikov	140
Coaxial Aperture Arrays Produced by Ultrafast Direct Femtosecond Laser Processing with Spatially Multiplexed Cylindrical Vector Beams D.V. Pavlov, A.P. Porfirev, A. Dyshliuk and A.A. Kuchmizhak	148
One-Step Fabrication and Functionalization of Nanostructured Silicon Surfaces for Advanced Sensing Applications A.Y. Mironenko, M.V. Tutov, A.K. Chepak, E. Mitsai, A.A. Sergeev, S.O. Gurbatov and A.A. Kuchmizhak	154
Magnetooptics of Nanocomposites Based on Iron Chalcogenide Nanoparticles R.D. Ivantsov, D. Petrov, O.S. Ivanova, I.S. Edelman, S.M. Zharkov, D. Velikanov and C.R. Lin	160
Transformation of the Nanoporous Structure of Anodic Aluminium Oxide and its “Nonelectrolysis” Electroluminescence D. Ovechenko and A. Boychenko	166
Comparative Study of Bismuth Composites Obtained via Pulsed Laser Ablation in a Liquid and in Air for Photocatalytic Application V.A. Svetlichnyi, E.D. Fakhrtudinova, T.S. Nazarova, S.A. Kulinich and O.V. Vodyankina	172
Defects and Morphology Contribution to Photoluminescence of CH₃NH₃PbI₃ Nanostructured by Femtosecond Laser Pulses P. Tonkaev, A.Y. Zhizhchenko, D.S. Gets, A. Larin, D. Zuev, A.M. Zakharenko, A.A. Kuchmizhak and S.M. Makarov	179
Effect of Solvent Annealing on Optical Properties of Perovskite Dualfunctional Devices G.A. Verkhogliadov, M.A. Masharin, D.S. Gets, E.Y. Danilovskiy, S.M. Makarov and A.A. Zakhidov	185
Fabrication of Anisotropic Structures on the Surface of Amorphous Silicon by Femtosecond Laser Pulses D.V. Shuleiko, M.N. Martyshov, D.V. Orlov, D.E. Presnov, S.V. Zobotnov, A.G. Kazanskii and P.K. Kashkarov	192
Pulsed Laser Ablation of Silicon Nanowires in Water and Ethanol S.V. Zobotnov, A.V. Skobelkina, F.V. Kashaev, A.V. Kolchin, V.V. Popov, D.E. Presnov, E.A. Sergeeva, M.Y. Kirillin and L.A. Golovan	200
Properties of Bi and BiSb Nano-Dimensional Layers in THz Frequency Range I.L. Tkhorzhevskiy, A.D. Zaitsev, P.S. Demchenko, D.V. Zykov, A.V. Asach, A.S. Tukmakova, E.S. Makarova, A. Novotelnova, N.S. Kablukova and M.K. Khodzitsky	206
Photonic Nanojet Generation in Transmission and Reflection Mode A.A. Sergeev, K.A. Sergeeva, A.V. Nepomniaschiy and S.S. Voznesenskiy	213
Femtosecond Pulse Structuring of Multicore Fibers for Development of Advanced Fiber Lasers and Sensors A.V. Dostovalov, A.A. Wolf, K.A. Bronnikov, M.I. Skvortsov, A.E. Churin and S.A. Babin	221

Chapter 3: Formation and Properties of Ferromagnetic and Ferroelectric Materials, Spintronics

Identification of Structure Ordering of Melt-Spun Fe₇₀Cr₁₅B₁₅ Alloy by the Entropy Functionals	
A.M. Frolov and T.A. Pisarenko	229
Magnetic Properties of Nanocrystalline (Nd,R)-(Fe,Co)-B (R = Pr, Ho) Alloys after Melt Spinning, Severe Plastic Deformation and Heat Treatment	
L.A. Ivanov, T. Kaminskaya, I. Tereshina, V. Davydov, V.V. Popov, G.A. Politova and S.V. Dobatkin	235
Concentration Phase Transition in a Two-Dimensional Ferromagnet	
A.K. Chepak, L.L. Afremov and A.Y. Mironenko	244
Calculation of Order Parameter and Critical Exponents of the Spin Glass in the Frame of Edwards-Anderson Model	
D. Kapitan, A. Rybin, P.D. Andriushchenko, V. Kapitan, E.V. Vasiliev and K. Nefedev	251
Monte Carlo Simulation of Magnetic Skyrmions in Ferromagnetic Films	
A. Perzhu, E.V. Vasiliev, D. Kapitan, R. Volotovskiy, A. Rybin, K. Soldatov, A. Makarov, V. Strongin, A. Korol, Y. Shevchenko, K. Nefedev, K. Nefedev and V. Kapitan	256
Features of Surface Morphology and Magnetic Properties of Sm_{0.5}R_{0.5}Fe₂ (R = Tb, Gd) Compounds	
G.A. Politova, T. Kaminskaya, A. Karpenkov, N.Y. Pankratov, M. Ganin, D. Dankin, V.V. Popov and A. Filimonov	261
Blocking Temperature of a System of Core/Shell Nanoparticles	
L.L. Afremov, S. Anisimov and I. Iliushin	270
Multiscale Magnetic Anisotropy in Amorphous Ferromagnetic Ribbon: An Example of FeCuNdSiB Alloy	
N. Ilin, S. Komogortsev, V. Ivanov, G.S. Kraynova, A. Davydenko, I. Tkachenko, R. Iskhakov and V. Plotnikov	275
Monte Carlo Simulations of the Fast Remagnetization Process in FePt Granular Films	
Y. Shevchenko, R. Volotovskiy, E.V. Vasiliev, A. Perzhu, D. Kapitan, A. Rybin, K. Soldatov, A. Makarov, V. Strongin, A. Medvedeva, V. Kapitan and K. Nefedev	281
Preparation and Structure of Oxide and Reduced Nd(Fe_{1-x}Co_x)B Nanoparticles	
G. Ahmadpour, A.Y. Samardak, F. Nasirpouri, A.S. Samardak and A.V. Ognev	288

Chapter 4: Nanostructured Coatings, Nanocomposites, Functional Hybrid Materials

Heat Treatment of Nanostructured Powders Obtained by Spark Erosion of WC-8Co Cemented Carbide in Oil	
M. Dvornik and E.A. Mikhailenko	297
Increased Antibacterial Activity by Photoactivation of Composites Based on ZnO Nanoparticles	
D.A. Goncharova, S.A. Kulinich, A.L. Nemoykina and V.A. Svetlichnyi	303
Formation of PEO-Coatings for Implants Materials	
K.V. Nadaraia, A.I. Pleshkova, M.A. Piatkova, I.M. Imshinetsky, D.V. Mashtalyar, N.G. Plekhova, S.L. Sinebryukhov and S.V. Gnedenkov	309
Synthesis of Phosphate Phases on Polysaccharide Template	
V.E. Silant'ev, V.S. Egorkin, L.A. Zemskova, S.L. Sinebryukhov and S.V. Gnedenkov	314
Influence of Formation Conditions on Corrosion Behavior of PEO-Coatings during Salt-Spray Test	
V.S. Egorkin, I.E. Vyaliy, A.S. Gnedenkov, N.V. Izotov, D.K. Tolkanov, A.K. Runov, A.N. Minaev, S.L. Sinebryukhov and S.V. Gnedenkov	319
Morphology and Chemical Composition of Organic Coatings Formed Atop PEO-Layers	
V.S. Egorkin, U.V. Kharchenko, N.V. Izotov, I.E. Vyaliy, A.S. Gnedenkov, D.K. Tolkanov, A.K. Runov, A.N. Minaev, S.L. Sinebryukhov and S.V. Gnedenkov	325
Formation of Protective Coatings on AMg3 Aluminum Alloy Using Fluoropolymer Nanopowder	
V.S. Filonina, K.V. Nadaraia, D.V. Mashtalyar, A.S. Gnedenkov, I.M. Imshinetsky, A.P. German, I.E. Vyaliy, V.S. Egorkin, A.N. Minaev, S.L. Sinebryukhov and S.V. Gnedenkov	330

Nanocomposite of Tin and Lead Oxides Prepared in Plasma of Pulsed High-Voltage Discharge Process: Synthesis and Electrochemical Characteristics S.V. Gnedenkov, V.G. Kuryavyi, D.P. Opra, S.L. Sinebryukhov, A.A. Sokolov, A.I. Neumoin and V.I. Sergienko	335
Methods for Controlling the Surface Architecture of Coatings Formed by Plasma Electrolytic Oxidation V.S. Rudnev, K.N. Kilin, I.V. Lukiyanchuk and M.S. Vasilyeva	341
Comparison of Ordering Characteristics of Anodicformed Nanostructured Aluminum and Titanium Oxides Coatings N.B. Kondrikov, P.L. Titov, S.A. Shchegoleva, V.B. Cherepanov and M.S. Vasileva	349
Computer Simulation of Oxygen Vacancy Formation in YFeO₃ Perovskite A.A. Gnidenko, P.G. Chigrin and E.A. Kirichenko	355
Correlation between the Properties of PEO-Layer and Coating Formation Current Density S.N. Suchkov, M.S. Gerasimenko, K.V. Nadaraia, I.M. Imshinetsky, D.V. Mashtalyar, A.N. Minaev, S.L. Sinebryukhov and S.V. Gnedenkov	361
PEO Coated Porous Mg/HAp Implant Materials Impregnated with Bioactive Components A.B. Podgorbunsky, I.M. Imshinetsky, A.S. Gnedenkov, S.L. Sinebryukhov and S.V. Gnedenkov	366
Incorporation of TiO₂(B) Nanoparticles into PEO Coatings on MA8 Magnesium Alloy I.M. Imshinetsky, K.V. Nadaraia, A.A. Sokolov, S.N. Suchkov, A.I. Pleshkova, D.V. Mashtalyar, S.L. Sinebryukhov and S.V. Gnedenkov	372