

**Devoted to the 65<sup>th</sup> anniversary of victory in Great Patriotic War and  
to the 90th anniversary of P.T.Oreshkin birthday**

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**SEMICONDUCTOR PHYSICS AND NANOMATERIALS**

(Based on the materials of II All-Russian school-seminar for undergraduate, post-graduate students and young scientists in the line «NANOMATERIALS»)

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Key words: intricate systems, self-organization, bifurcation, technological systems, disordered semiconductors.

Aspects of intricate systems theory and self-organization applied to technologies of materials for micro- and nanoelectronics are posed. New methods of elimination of existing problems in the modern materials science are grounded. Principals of new technological systems for the synthesis of micro- and nanoelectronics materials with desired properties are developed ..... 9

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Key words: activation-drift model, deep centers, relaxation time, barrier layer, Frenkel effect, transient spectroscopy, lowfrequency noise.

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Key words: heterostructure, quantum well, deep level transient spectroscopy.

Results of quantum well (QW) structures ZnSSe/ZnMgSSe investigation by current deep level transient spectroscopy (CDLTS) and the QW structure CdS/CdSSe investigation by CDLTS methods and C-V characteristics are presented. CDLTS-spectra contain peaks resulting from charge carriers' emission from a QW. The band offsets were estimated..... 39

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Key words: contact phenomena, disordered semiconductors, Poisson equation, experimental investigation techniques.

The peculiarities of contact phenomena in barrier structures based on disordered semiconductors are investigated in this paper. It is shown that the electrophysical properties of the contact are determined by localized states in the mobility gap of semiconductor. The mathematical tool for theoretical description of contact phenomena is developed. The experimental investigation techniques are reviewed. The comparative analysis of theoretical and experimental results is carried out..... 46

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Keywords: electret, the gauge, charge, a relaxation, thin-film polimer.

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Key words: scanning probe microscopy (SPM), equipment for nanotechnology, NANOFAB, INTEGRA.

Nowadays the increased interest to nanotechnologies in general and, therefore, to the necessary equipment for fundamental and applied work, to the technical support of new productive capacities identified as nanotechnology productions can be seen. Possible options of problems solution being now performed by NT-MTD company group developers will be shown in the given report..... 57

*A.A. Tikhomirov.* FUNDAMENTALS OF SPM AND METHODS OF ITS APPLICATION IN MODERN SCIENTIFIC RESEARCHES

Key words: SPM, nanotechnological equipment, NANOFAB, NTEGRA.

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*V.I. Zubkov.* ADMITTANCE SPECTROSCOPY – EFFECTIVE METHOD OF SEMICONDUCTOR QUANTUM DIMENSIONAL STRUCTURES DIAGNOSTICS

Key words: nanoelectronics, quantum well, quantum dot, admittance.

In the last decade a cardinal conversion to electronic devices and structures microminiaturization is observed in electronics. The tens' and units' nanometers range is mastered. In this connection the look-up of new methods of nanoelectronic devices and structures investigation and existing traditional methods revision can be seen. In this paper the line of the examples obtained by the author shows that methods of

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Key words: Non-crystalline semiconductors, chemical modification, structural modification, application.

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Key words: phase change memory cells; Ge-Sb-Te alloys.

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Key words: heterophase ferroelectric films, PZT, nonvolatile memory, optical reading of information.

It was shown that the process of heterophase PZT thin films ageing is accompanied by significant increase of oxygen concentration and is intensified in the films with excess lead oxide content. It was experimentally confirmed that the value and direction of steady-state photocurrent in the short-circuit duty of capacitor structure are determined by the value and direction of ferroelectric film remanent polarization. The new method of information optical reading by the direction of photocurrent in the short-circuit duty in the capacitor memory cell based on PZT films is offered..... 87

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Key words: sol-gel nanotechnology, nanostructured composite, semiconductor metal-oxides, gas sensors.

The model of semiconductor layers formation in sol-gel processes, including stages of a continuous transition of a fractal aggregate's growth mechanisms from diffusion limited to cluster-clustered aggregation with follow-on evolution, finished as a rule by spinodal dissociation is developed. Peculiarities of fractal structures formation and their dependence on the thermodynamic and kinetic production conditions are obtained by atomic force microscopy. Peculiarities of a gas-sensitivity analytical response in the measurement's ordinary moment may form the basis of new reticular gas sensing nanocomposites analysis method..... 92

*Yu.A. Danilov.* MAGNETIC SEMICONDUCTOR NANOSTRUCTURES FOR SPINTRONICS DEVICES

Key words: spintronics, ferromagnetic semiconductors, laser deposition, MOCVD epitaxy, quantum well, spin light-emitting diode.

Analysis of physical and technological problems, which arise at fabrication of

semiconductor spin electronic devices, was performed. The laser method for formation of III-V semiconductor layers highly doped by manganese was proposed and realized. The method does not demand high-cost equipment, as in the molecular-beam epitaxy, and possesses enough high productivity. It was shown that InMnAs and GaMnAs layers produced by laser deposition are ferromagnetic with Curie temperatures of 310 and 60 K respectively. Peculiarities of spin light-emitting diodes creation on the basis of heteronanostructures with InGaAs/GaAs quantum well and their principal characteristics were discussed ..... 98

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