

**Gavrilenko V. P., Mityukhlyayev V. B., Rakov A. V., Todua P. A., Filippov M. N., Sharonov V. A.** *Effect of Contamination in a SEM on the Profile of Relief Structures in the Nanometer Range* . . . . . 2

We present the results of the study of the effect of contamination in a S-4800 SEM on the profiles of relief elements of the MSHPS-2.0K measure of the nanometer range. It is shown, that the electron irradiation leads to the modification of the profiles of the relief elements. Dependences of the profile parameters on the electron irradiation dose are presented for different irradiation modes.

**Keywords:** contamination, scanning electron microscope, relief elements, test object MSHPS-2.0K

**Kostrov A. I.** *Macromodel of a Memory Cell with a Magnetic Tunnel Junction* . . . . . 7

We have developed electric macromodel and equivalent circuit of a magnetoresistive memory cell based on a magnetic tunnel junction with a spin transfer torque writing approach. Nonlinear resistors have been used to represent parallel and antiparallel magnetizations of ferromagnetic layers. The model aims to be used in computer modeling and design of integrated circuits. Its efficiency has been demonstrated on the example of the magnetoresistive memory module.

**Keywords:** magnetoresistive memory, spintronics, magnetic tunnel junction, simulation, macromodel, spice

**Dodulad O. I., Kloss Yu. Yu., Martynov D. V., Rogozin O. A., Ryabchenkov V. V., Tcheremissine F. G., Shuvalov P. V.** *Problem Solving Environment for Computing and Analyzing the Gas Kinetic Processes* . . . . . 12

The article describes the structure, functionality and application domain of the developed problem-modeling environment (PSE). It based on solving the kinetic equation by finite-difference schemes and uses the projection method for evaluating the collision integral. Promising directions are developed in PSE: unstructured grids, TVD schemes, multiprocessing and GPU computing. The list of features is supported by numerous examples of simulating real-world problems.

**Keywords:** problem solving environment, kinetic equation, computer simulation, parallel computing, unstructured grids, GPU, microdevices, shock waves

**Kovalevsky A. A., Strogova A. S., Plyakin D. V., Tzibylsky V. V., Borisevich V. M.** *Transformation of Germanium Silicate Glasses into Germanium Nanoclusters* . . . . . 18

With the use of Raman scattering of light, IR-spectrographic, high-resolution electronic and atomic power microscopy and analysis of X-rays diffraction the results of investigation of the process of self-organization of nanoclusters of germanium in the films of Germanium Silicate glass (GSG) —  $(Si_xGe_yO_z)$  attained in the process of oxidation and heat treatment of nanostructures films of polycrystalline silicone doped by Germanium (NSFPCS(Ge)) are presented.

Mechanism of Germanium edging in GSG to the border of division of GSG-gate which includes the stages: layering between  $GeO_2$  and  $SiO_2$ , the subsequent restoration by silicone and oxygen  $GeO_2$  up to Ge with their subsequent growth is being investigated.

**Keywords:** Germanium nanoclusters, Germanium Silicate glass, spectrum of Raman light dispersion, Germanium edging

**Timoshenkov S. P., Gaev D. S., Boyko A. N., Gorshkova N. M.** *Research and Development of Getters Coatings for MEMS* . . . . . 24

The magnetron sputtering have been made the nanostructured films of structure  $Ti_{1-x}V_x$ , which are of interest in quality getters coatings for using in microelectromechanical systems. It is shown that received coatings have the expressed granulated character, with the size of grains in a range of 20—120 nanometers. The calculated values fractal dimensions testify to high specific surface of coatings.

**Keywords:** MEMS, getters coatings, nanostructuring, fractal structures

**Chigirev P. M.** *The Application of Graphene in Electronics* . . . . . 28

The article considers the application of graphene in electronics and electronic engineering, both the existing and potential. It describes principles of creating transistors based on graphene using planar technology. Also it considers the process of creating a prototype chip nonvolatile memory, magnetometers, photodetectors, ultra-sensitive mass sensors based on graphene.

**Keywords:** graphene, the application of graphene, graphene-based transistor, magnetometers based on graphene, graphene-based photodetector, the mass sensors based on graphene

**Dudin A. A., Kustov E. F.** *Geometric and Physical Properties of Magnetic Iron Nanoparticles* . . . . . 30

We investigate the structure of coordination spheres or orbits of crystals with hexagonal and cubic structure, their size and coordination number. Computed the orbits of the atoms of all sublattices of octahedral and tetrahedral voids. As the basic structures are considered close-packed structures FCC- and HCP- oxygen ions of magnetic materials. The distribution of metal cations of both structures is carried out on the octahedral and tetrahedral voids. The obtained data can help pinpoint the physical properties of particles and materials based on magnetic nanoparticles.

**Keywords:** the structure, coordination sphere, orbit, crystal, magnetic clusters

**Korpuhin A. S., Babayevsky P. G., Zhukov A. A., Kozlov D. V., Smirnov I. P.** *Effect of Formation Conditions and Thickness of Bearing Polyimide Films and Functional Metal Layers on Thermodeformation Characteristics of Polyimide-Silicon Elastic-Hinge Laminated Cantilever Beams of Thermal Actuators* . . . . . 34

Effect of formation conditions and thickness of polyimide bearing films as well as state of polyimide-silicon elastic-hinge laminated cantilever beams during their imidization process and different metal functional layers thickness on the beams initial deflection angle and its change at heating and cooling was studied. It was determined, that directional regulation of the beams thermodeformation characteristics depended most important on imidization temperature, polyimide film thickness in elastic-hinge region and the beam free or restricted states during imidization process. Functional metal layers with thickness about 0,1  $\mu$  have slight effect on the beam thermodeformation performances but with the thickness increased deteriorated them.

**Keywords:** thermal actuator, polyimide, silicon, metal, elastic-hinge laminated cantilever beams, formation conditions, thermodeformation characteristics

**Voitsekhovskii A. V., Nesmelov S. N., Kulchitsky N. A., Melnikov A. A.** *Uncooled Microbolometer Based on Polycrystalline SiGe for Infrared Spectral Range* . . . . . 41

The features of the technology of uncooled microbolometer detectors based on polycrystalline films of germanium silicide, and the parameters of discrete and matrix detectors based on this material were considered. Potential benefits of this type of detectors can be realized by combining the technology of the detectors to silicon CMOS technology.

**Keywords:** infrared detectors, microbolometer, polycrystalline germanium silicide

**Malyshev K. V., Chernyshev S. L.** *Current-Voltage Characteristics of Figured AlGaAs Superlattices*. . . . . 48

A current-voltage characteristics of a new class of semi-conductor superlattices based on figured numbers is theoretically investigated. Figured superlattices are compared to standard periodic superlattices and quasiperiodic fibonacci superlattices. To compare the resonant tunneling properties of superlattices information value is applied.

**Keywords:** current-voltage characteristic, superlattice, quasiperiodic, nanostructure, 1D quasicrystal, figure number, Fibonacci number, information value

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