### CONTENTS

Putilov A. V. On the Development of the Works in Russia	
in the Area of Nanomaterials and Nanotechnologies	7

The materials of the report in the condition and the development of nanotechnology and nanomaterials creation discussed in the meeting of the Ministry of the industry, science and technologies of Russia Federation are stated.

# Atlasov K. A., Veiko V. P., Kalachev A. I., Kaporsky L. N. Laser-Based Technology of Forming the Near-Field Optical Probes

The implementation of the scanning probe microscopy and the near-field microscopy based devices introduces new possibilities in micro and nanoelectronics. The main operating tool is the probe (for instance, a tapered optical fiber) with the apex dimensions of ~100 nm. In the present paper the investigations of the laser-based technology for probe forming are carried out. These investigations are aimed at the manufacturing process study, since its parameters are of vital importance for the probe quality, technical characteristics and reproducibility.

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The requirements for sensing and transducing instruments (STI) designed for rocket-space technology are summarized. The principal trends of STI improvements based on advanced technology are presented.

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Principals of constructive and technological modules creation in Microelectronics and Microsystems techniques are introduced and considered. Thesis related to priority of constructive type modules for Microelectronics and preference of technological type modules for Microsystems Engineering substantiated.

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The configurations of the silicon nanocrystals with sizes about  $10^2-10^4$  atoms with maximal absolute value of binding energy were found by the gradient-search method. Surface atoms were either free or dimerizeted or fixed by the solid matrix. The atomic interactions in the cluster were described by the Tersoff's empirical interatomic potential. Surface energy for (100), (110), and (111) surfaces of sili-

con have been calculated. It has been shown that dimerization of free surface Si(100) sufficiently (doubly) decreases the surface energy.

The formation energies of the simple defects in the nanocrystals of various sizes have been calculated.

The hydrostatic pressure dependence of the bulk modulus of elasticity has been studied. It has been shown that at hydrostatic positive or negative pressure, it may be the configurational transition of vacancy or of interstitial. It has been shown that the configurational transition lead to step change of the value of the bulk modulus of elasticity. Moreover the value of this step change is inversely as the number of the nanocrystal atoms.

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The trends of the development of the modern tribology on microand nanolevels are indicated. The problems are disclosed and the directions of their solutions are given, and also it's shown their correlation with the traditional tribology.

## Valiev K. A., Kaljnov V. A., Kirjianov V. A., Maljtsev P. P. Optical Interferometers in the Integral Micromechanics. . . . . . . 28

The method of an optical interferometry with reference to making of countermeasure feelers of microsystem engineering surveyed on the basis of use of mobile diffraction gratings.

#### Noyojilov E. V. On Reduction to Simplified Form of Differential-Algebraic Equations for Circuit Simulation.....30

We consider linear differential-algebraic equations (DAEs) with the variable coefficients that satisfy the special conditions of constant rank. These systems arise particularly in such applied mathematical problems as circuit simulation, chemical reactions modeling and different vehicle system dynamics simulation (on macro-level as well). There's suggested a method for reduction of considered systems to simplified form. The reduction is based on an iteration method. It is applicable for the systems with arbitrary index value and can be used for numerical solution of DAEs when modeling listed above processes.

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The processes of the condenser charging and discharging are considered. One facing of this condenser is made from the metal and the second one is made from the metal electrode is plotted from the outer side.

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