

**Maltsev P. P., Bocharov L. Yu.** *The Characteristic of a Condition and Course of Realization of the US Program Research and Development in Area Nanotechnology (National Nanotechnology Initiative)* . . . . . 2

In article the condition and a course of realization of the American program of works in area nanotechnologies — NNI (National Nanotechnology Initiative) are considered. The special attention is given to the characteristic of researches and the workings out of program NNI spent in interests of the US Department of Defense.

**Keywords:** nanotechnology, nanoscience, research and development, US National Nanotechnology Initiative, basic research, US Department of Defense, strategic plan, program objective

**Ageev O. A., Ilin O. I., Kolomiitsev A. S., Konoplev B. G., Rubashkina M. V., Smirnov V. A., Fedotov A. A.** *Determination of Geometrical Parameters of Vertically Aligned Carbon Nanotube Forest by Atomic Force Microscopy*. . . . . 9

Results of experimental researches of geometrical parameters of the carbon nanotubes, of the density of the vertically aligned carbon nanotube forest (VACNT) in contact, semicontact and noncontact modes of atomic force microscopy (AFM) are presented. The rapid-technique of determination of the VACNT forest height by method AFM is developed. Using this technique the values of the maximum and average height of nanotubes for the experimental sample of the VACNT forest equal to 1,98 mkm and  $1,12 \pm 0,45$  mkm, respectively, are defined. The density nanotubes in the VACNT forest equal  $31 \text{ mkm}^{-2}$  is defined by noncontact mode AFM. The obtained results can be used for the development of the nanodiagnostic methods and for the technological processes of the formation of the micro- and nanoelectronic elements on the basis of VACNT.

**Keywords:** nanodiagnostic, atomic force microscopy, scanning electron microscopy, vertically aligned carbon nanotubes, geometrical parameters of carbon nanotubes, modes of AFM

**Ichkitidze L. P., Ryndina T. S., Selichshev S. V., Ponomareva O. V., Tabulina L. V., Shulitsky B. G., Galperin V. A., Shaman Yu. P., Blagov E. V.** *Bulk Composite Nanomaterial Based on Protein and Multiwall Carbon Nanotubes* . . . . . 13

The properties of the biocompatible composite nanomaterials (CNM) based on bovine serum albumin (BSA) and multi-walled carbon nanotubes (MWCNT), both functionalized and non-functionalized were investigated. In the manufacture of bulk CNM of 25 wt. % aqueous suspensions of BSA (0,0015–0,04) wt. % MWCNT and MWCNT<sub>f</sub> used the method of laser nanotechnology.

Optical density and absorption coefficient of aqueous suspensions BSA + MWCNT<sub>f</sub> were 5–10 higher than the corresponding parameters of suspensions based on BSA + MWCNT. Hardness values CNM of BSA + MWCNT<sub>f</sub> was ~ 250 MPa, and in the case CNM of BSA + MWCNT ~ 300 MPa, which is 5–6 times higher than in control samples of pure BSA and BSA + carbon black K-354 (~45–50 MPa). Tensile strength of CNM ( $\sigma \sim 30$  MPa) was an order of magnitude lower than their hardness. The maximum value of the specific hardness  $H_v/\rho \sim 0,24 \text{ MPa}/(\text{kg}/\text{m}^3)$  and specific strength  $\sigma/\rho \sim 0,024 \text{ MPa}/(\text{kg}/\text{m}^3)$  for CNM almost identical with the corresponding values for human porous bone tissue.

**Keywords:** carbon nanotubes, functionalization, albumin, suspense, hardness, strength, biocompatible composite nanomaterial

**Mustafaev A. G., Savinova A. M., Mirzaeva P. M.** *Integral Element Structures Forming Process Management* . . . . . 20

Production of integrated elements is a complex multifactorial and multistage process. Modern technological processes of formation integral elements structures included using low-temperature non-equilibrium pulsed and radiation-induced technological operations. Solution to the problem of technological processes management based on an understanding of the relationship between the properties of products, particularly their production technology and characteristics of the equipment with which this technology is realized. The developed approaches process control enable eliminate the subjective factor and increase the efficiency of management systems. Shown, that the main technological operations, significantly affecting the output characteristics of integral elements in their production are ion implantation, annealing, etching. Study and simulation of these operations will make recommendations on management and to develop algorithms for effective technological process management formation of the structures of integral element.

**Keywords:** technological process, process control, integral elements, modeling of technological process

**Rathkeen L. S.** *Modern Technologies of MEMS Producing*. . . . . 23  
In 2011 in Moscow Russian association of developers, producers and customers of microelectromechanical systems organized International forum of modern technologies of producing and prospective of MEMS development, on which were shown the results of scientific researches of leading organizations for main directions of branch development.

**Keywords:** microelectromechanical systems, MEMS, space researchers, wireless autonomous battery-free sensors, communication technics, microoptoelectrostatic switchers, government support, academician mobility, multichannel module for pressure measuring

**Voitsekhovskii A. V., Nesmelov S. N., Kulchitsky N. A., Melnikov A. A. Maltsev P. P.** *Types of Detectors of Terahertz Radiation*. . . . . 25

A comparative analysis of the main types of detectors of terahertz range was carried out. It is shown that is being developed low-temperature THz detectors with characteristics close to the limit. Promising for broadband detection of high-temperature detectors were analysed.

**Keywords:** terahertz radiation, detector, direct detection, heterodyne detection, frequency band, sensitivity

**Matyushkin I. V.** *The Estimation of Charge Retention Time for Si Nanocrystals Flash Memory Cell*. . . . . 34

In the framework of  $(2n + 1)$ -levels ( $n = 4$ ) band structure model of the Si-nanocrystal, as a carrier of charge, the Fermi level value is considered. It is shown that the typical time charge leakage to the bulk Si is: for conduction band electrons — less than 10 s (up to microseconds, depending on the tunnel SiO<sub>2</sub> layer thickness), for electrons in a trap — more than 10 years.

**Keywords:** silicon nanocrystals (nc-Si), non-volatile memory, retention time, Fermi level

**Akopyan V. A., Zakharov Yu. N., Panich A. E., Parinov I. A., Rozhkov E. V., Shevtsov S. N.** *Effectiveness of Piezoelectric Generators of Cantilever Type: Theoretical Estimates and Experimental Results* . . . . . 42

As a result of computational and test analysis of electric physical parameters of the cantilever type piezoelectric generator (PG), the PG optimal parameters have been calculated and confirmed allowing one to obtain maximal output power with high useful action factor. It has been presented an example of realizing small-size experimental model of PG for accumulator charging sensor control systems of gas parameters in gas-tubing, diagnostics of technical state of high-height buildings and low-power devices of household appliances.

**Keywords:** piezoelectric generator, finite-element analysis, cantilever, electric physical characteristics, output power, electric mechanical transformation

**Alfimov S. M.** *Special Purpose Microrobots': State and Development Trends*. . . . . 49

The multicomponent microrobotic's status and trends are analyzed. Microrobot's functional tasks, and a unified on-board control system's structure are justified.

**Keywords:** microsystem, microrobot, elements, components, autonomy, unification

**For foreign subscribers:**

*Journal of "NANO and MICROSYSTEM TECHNIQUE" (Nano- i mikrosistemnaya tekhnika, ISSN 1813-8586)*

*The journal bought since november 1999.*

*Editor-in-Chief Ph. D. Petr P. Maltsev*

**ISSN 1813-8586.**

**Address is: 4, Stromynsky Lane, Moscow, 107076, Russia. Tel./Fax: +7(499) 269-5510.**

**E-mail: nmst@novtex.ru; http://novtex.ru/nmst/**

Адрес редакции журнала: 107076, Москва, Стромьинский пер., 4. Телефон редакции журнала (499) 269-5510. E-mail: nmst@novtex.ru  
Журнал зарегистрирован в Федеральной службе по надзору за соблюдением законодательства  
в сфере массовых коммуникаций и охране культурного наследия.  
Свидетельство о регистрации ПИ № 77-18289 от 06.09.04.

Дизайнер Т. Н. Погорелова. Технический редактор Е. М. Патрушева. Корректор Т. В. Пчелкина

Сдано в набор 18.01.2012. Подписано в печать 21.02.2012. Формат 60×88 1/8. Заказ МС312.

Цена договорная

Оригинал-макет ООО «Авансед солюшнз».

Отпечатано в ООО «Авансед солюшнз». 105120, г. Москва, ул. Нижняя Сыромятническая, д. 5/7, стр. 2, офис 2.