

**Koleshko V. M., Polynkova E. V., Hmurochich N. V., Chashinski A. S.** *Nanotechnology of Metall Hydrogen: Modelling of ELITE-Syntesis. Part 1* . . . . . 2

This article discusses the possibility of creating technology for metallic hydrogen. Presented implementation ELITE-process. Molecular dynamics method evaluated the possibility of using nanotubes as a container for solid hydrogen.

**Keywords:** ELITE-process, metallic hydrogen, carbon nanotube, molecular dynamics

**Zhirikova Z. M., Kozlov G. V., Aloe V. Z.** *The Dependence of Polymer Nanocomposites Reinforcement Degree on Carbon Nanotubes (Nanofilaments) Geometry* . . . . . 5

The scaling model, describing the dependence of reinforcement degree of polymer nanocomposites filled with carbon nanotubes (nanofilaments) on nanofiller geometry has offered. The indicated geometry is characterized by the radius of ring-like structures, formed by these anisotropic nanofillers. The good correspondence of theory and experiment has obtained for a nanocomposites wide set.

**Keywords:** nanocomposite, carbon nanotubes (nanofilaments), reinforcement degree, nanofiller geometry, ring-like structures

**Glukhova O. E., Kossovich E. L.** *Explicit Models of Flexural Edge Waves Propagation in Multi-Layer Graphene Plates* . . . . . 8

Deflection of the multi-layer graphene plate consisting of 15—100 layers is studied within the elasticity theory of the continuum media. The explicit dual parabolic-elliptic models are constructed, describing the propagation of Kononov flexural edge wave in multi-layer graphene plates in the cases of different types of edge loading. These models well-approximate the exact solution of the aforementioned problem outside the vicinity of the applied force, and also near the edge. It can be noticed that with the growth of the layers amount for graphene plate, its strength also grows.

**Keywords:** flexural edge wave, multi-layer graphene, plate, Young's modulus, Poisson's ratio, flexural stiffness, frequency of the applied force, Kirchhoff theory of plate bending, parabolic equation, elliptic equation

**Kovalevsky A. A., Tsubulsky V. V., Vlasukova L. A., Strogova A. S., Luchenok A. R., Shevchenok A. A.** *Nanosized Titanium Disilicide: Synthesis, Structure, Properties. Part 1* . . . . . 15

The conditions of synthesis, composition and structure of the semiconducting titanium disilicide obtained by combining of mechanical activation and self-propagating high-temperature synthesis have been investigated.

It was established that the use of nanosized titanium and silicon powders while obtaining titanium disilicide during the self-propagating high-temperature synthesis in argon at Ti/Si mass ratio of 0,86 and in the presence of small mass of sulfur additions (0,001—0,005) allows to synthesize the nanostructured titanium disilicide with particles dispersion of 10—30 nm. That gives a good reason to use it as a catalyst for water decomposition in the visible light.

**Keywords:** mechanical activation, milling, titanium disilicide, nanosized powders of silicon and titanium, self-propagating high-temperature synthesis

**Lu P., Ivanets V. A., Semenistaya T. V., Plugotarenko N. K.** *Investigation of the Influence of Structure of Films Based on Silver-Containing Pan on their GAS-Sensitivity with Application of the Theory of Self-Organization, Information Theory and Atomic-Force Microscopy* . . . . . 21

Samples of conductive films based on Ag-containing polyacrylonitrile (PAN) were fabricated. The correlation of electrical-physical and gas sensitive properties and morphology of the surface of the films based on Ag-containing PAN with the technological parameters of the process of formation of the polymer, the method of application of film-forming solution on the substrate and mass content of silver in the samples was established.

**Keywords:** functional conducting organic polymers, metal-polymer organic composites, gas-sensor materials, self-organization, information theory, atomic-force microscopy

**Averin I. A., Moshnikov V. A., Pronin I. A.** *A Peculiarities of the Maturation and Spinodal Decomposition of Self-Organising Fractal Systems* . . . . . 29

Qualitative and quantitative regularities of thin films synthesis process (method sol-gel technology), have been formed on the foundations of theoretical models and experiments are represented. The influence on the temperature of the anneal, kinds of solvents and types of substrates on the morphostructure of the films surface is shown. The synthesis method of films for sensitive components of gas sensors, based on orthosilicic acid has also been found out.

**Keywords:** sol-gel technology, spinodal decomposition, nucleophilic growth

**Zaiarsky D. A., Portnov S. A., Gorin D. A.** *Electrophoretic Formation of Coatings Based on the Tris(8-hydroxyquinoline)Aluminum Microparticles Covered by Nanodimensional Polyelectrolyte Shell*. . . . . 33  
Core-shell structures were fabricated using tris(8-hydroxyquinoline)aluminum cores coated with layer-by-layer assembled polyelectrolyte shell. Conductive electrodes were coated by these microparticles using electrophoresis. Effective electrophoretic mobility of core-shell particles was calculated using experimentally measured zeta-potential values. Mass of adsorbed coating was obtained as function of electric field.

**Keywords:** core-shell structures, electrophoresis, microparticles, fluorescence

**Danila A. V., Gornev E. S., Shamiryan D. G., Gushin O. P., Krasnikov G. Ya.** *Metal Gate CMOS Technology for the Device Manufacturing 45 nm Node* . . . . . 38

In this work, we show the results of our research and development process of dry etching in  $\text{BCl}_3$ -based plasma TaN metal gate and  $\text{HfO}_2$  gate dielectric in situ, without changing the topology and without damage underlying Si in an industrial TCP reactor LAM Research 2300 Versys. The authors found that the TaN metal gate profile depends on the composition of film is deposited on the sidewalls of the gate. Cl from this film will react with TaN producing an undercut in the solid phase. Developed and patented process that we can become the basis for a CMOS metal gate technologies node 45 nm technology node and beyond in Russia.

**Keywords:** metal gate, dry etching, passivation, lateral undercutting, CMOS, etch profile

**Smakhtin A. P., Chuyan R. K.** *Experimental Research of Photovoltaic Converter Operating Characteristics under Monochromatic Radiation* . . . . . 44

One element of a space wireless power transmission system by the use of focused laser radiation is a receiver-converter of laser power to electric power. It is expediently to use ordinary semiconductor photovoltaic converters, which are the base of modern solar cells, as these converters. The use of monochromatic laser radiation makes possible to considerably increase the photovoltaic conversion efficiency. The experimental research results of the operating parameters of the silicon photovoltaic converter under monochromatic illumination with wavelengths 0,54  $\mu\text{m}$ , 0,60  $\mu\text{m}$ , 0,87  $\mu\text{m}$ , and 0,94  $\mu\text{m}$  at temperature of 300 K and 350 K are presented in the article. Resulting data are adequately to theoretical estimations.

**Keywords:** photovoltaic converter, monochromatic electromagnetic radiation, high efficiency

**Vopilkin E. A., Klimov A. Yu., Rogov V. V., Shuleshova I. Yu., Pryahin D. A., Gusev S. A., Skorohodov E. V., Shashkin V. I.** *MEMS Tunneling Accelerometer Sensor* . . . . . 48

A possibility of fabrication of a MEMS tunneling accelerometer without the feedback loop is demonstrated. The tunneling gap less than 10 nm is maintained due to the sensor structure at room conditions. The linear acceleration of the sensor causes displacement of the proof mass electrode. The displacement detector is based on a strong dependence of the tunneling on the gap between the electrodes. The sensor is fabricated from the silicon on insulator (SOI) wafer using the planar technology. In the 3,17 kHz frequency range the sensitivity reaches 2,221  $\text{g}/\text{Hz}^{1/2}$ . The resonant frequency of the first mechanical mode is about some MHz. Its lowering due to increase of the proof mass value can increase the resolution dramatically.

**Keywords:** MEMS, accelerometer, tunneling current

**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 19.03.2012. Подписано в печать 23.04.2012. Формат 60×88 1/8. Заказ МС512.

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.