

СОДЕРЖАНИЕ

Проблемы информации в области нанотехнологий и наноматериалов. Место России в мировом наносообществе. <i>Алдриевский Р.А., Ключарева С.В.</i>	3
О некоторых современных тенденциях в изучении свойств наноматериалов (обзор иностранной литературы). <i>Москвитин Г.В., Биргер Е.М., Поляков А.Н.</i>	14
О самоорганизации наноразмерных частиц в процессах их агрегации. <i>Жабров В.А., Марголин В.И., Тутик В.А.</i>	25
Физические основы атомно-молекулярной сборки. <i>Потапов А.А.</i>	32
Квантовая теория моделирования фемтосекундно-импульсной самосборки и самоорганизации активных нанометровых частиц в материалах. <i>Жуковский М.С., Безносюк С.А.</i>	41
Карбоксилированные углеродные нанотрубки как активные компоненты сенсорных устройств. <i>Запорожкова И.В., Поликарпова Н.П., Вилькеева Д.Э., Запорожков П.А.</i>	46
Исследование фото-, авто-электронной эмиссии в нанозернах антимонида и арсенида индия. <i>Жуков Н.Д., Глуховской Е.Г., Браташов Д.Н.</i>	51
Температурные зависимости теплоемкости и теплопроводности эпоксидных материалов, модифицированных металл/углеродными наноструктурами. <i>Артанов А.М., Загребин Л.Д., Мухаметшина И.Ю., Кодолов В.И., Чашкин М.А.</i>	57
Наномодифицированные гальванические покрытия. <i>Дьяков И.А.</i>	60
Бактерицидная система «наночастицы серебра – полипропиленовый волокнистый носитель»: получение и свойства. <i>Малиновская Т.Д., Лысак Г.В., Лысак И.А.</i>	69
Промышленные редкоземельные люминофоры для эффективных осветительных светодиодов. <i>Социн Н.П., Личманова В.Н., Большухин В.А.</i>	72
Исследование пористой структуры минерально-углеродных сорбентов для хроматографического разделения фуллеренов. <i>Постнов В.Н., Крохина О.А.</i>	78
Исследование микроструктур наноразмерных солей нитратов, подвергшихся внешнему давлению. <i>Кузнецова И.А.</i>	81
Захват и передислокация порции воздуха управляемым потоком нанодисперсной магнитной жидкости. <i>Баитовой В.Г., Подушин В.М., Боев М.Л., Ряполов П.А.</i>	84
Многокластерная нанотехнологическая установка для исследования и изготовления наносхем и функциональных наносистем для систем энергообеспечения космических аппаратов. <i>Дубовой А.Н., Родионов Б.Н., Егоров С.Д., Мазур С.Н., Коротеев А.В., Степанов М.В., Хлюстов П.М.</i>	91
Электрореологический эффект в полидиметилсилоксановой суспензии наноразмерного гибридного материала диоксид титана-полипропиленгликоль. <i>Агафонов А.В., Краев А.С., Давыдова О.И., Захаров А.Г.</i>	105
Некоторые аспекты токсичности наночастиц серебра в эксперименте со взрослыми мышами при пероральном приеме коллоидных растворов. <i>Петрицкая Е.Н., Абаева Л.Ф., Рогаткин Д.А.</i>	108
Взаимосвязь геометрических и электродинамических параметров фрактальных антенн. <i>Бабичев Д.А., Тутик В.А.</i>	113
НОВОСТИ	116
ANNOTATION	120

TABLE OF CONTENTS

Problems of information in the field of nanotechnologies and nanomaterials. Place of Russia in the world nanocommunity. *Andriyevsky R.A., Klyucharyova S.V.* 3

On some modern tendencies of studying properties of nanomaterials (overview of foreign literature). *Moskvitin G.V., Birger E.M., Polyakov A.N.* 14

On self-organization of nanosized particles during their aggregation processes. *Zhabrev V.A., Margolin V.I., Tupik V.A.* 25

Physical grounds of atomic and molecular assembly. *Potapov A.A.* 32

Quantum theory of simulating femtosecond pulse self-assembly and self-organization of active nanometer particles in materials. *Zhukovsky M.S., Beznosiyuk S.A.* 41

Carboxilized carbon nanotubes used as active components of sensor devices. *Zaporotzkova I.V., Polikarpova N.P., Vilkeyeva D.E., Zaporotskov P.A.* 46

Studying photo-, autoelectronic emission in nanograins of indium antimonide and arsenide. *Zhukov N.D., Glukhovskoy Ye.G., Bratashov D.N.* 51

Temperature dependence of heat capacity and heat conductivity of epoxy materials modified with metal/carbon nanostructures. *Artanov A.M., Zagrebin L.D., Mukhametshina I.Yu., Kodolov V.I., Chashkin M.A.* 57

Nanomodified galvanic coatings. *Dyakov I.A.* 60

«Silver nanoparticles – polypropylene fibrous carrier» bactericidal system: obtaining and properties. *Malinovskaya T.D., Lysak G.V., Lysak I.A.* 69

Industrial rare earth luminophores for effective enlightenment LEDs. *Soshchin N.P., Lichmanova V.N., Bolshukhin V.A.* 72

Studying porous structure of mineral-carbon sorbents for chromatographic separation of fullerenes. *Postnov V.N., Krokhina O.A.* 78

Studying microstructures of nanosized salts of nitrates subjected to external pressure. *Kuznetsova I.A.* 81

Capturing and transfer of air portion by steered flow of nanodisperse magnetic fluid. *Bashtovoy V.G., Polunin V.M., Boyev M.L., Ryapolov P.A.* 84

Multicluster nanotechnological setup for studying and manufacturing nanoschemes and functional nanosystems for energy supply systems of spaceships. *Dubovoy A.N., Rodionov B.N., Yegorov S.D., Mazur S.N., Koroteyev A.V., Stepanov M.V., Khluyustov P.M.* 91

Electrorheological effect in polydimethylsiloxane suspension of titanium dioxide-polypropyleneglycole nanosized hybrid material. *Agafonov A.V., Kravayev A.S., Davydova O.I., Zakahrov A.G.* 105

On influence of titanium dioxide nanoparticles upon internal organs of experimental animals at peroral introduction. *Petrinskaya E.N., Rogatkin D.A., Abayeva L.F., Yeliseyev A.A., Gavrilov A.I.* 108

Mutual connection of geometrical and electromagnetic parameters of fractal antennas. *Babichev D.A., Tupik V.A.* 113

NEWS 116

ANNOTATION 120

ISSN 1816-4498

АДРЕС РЕДАКЦИИ:
117246, г. Москва, Научный проезд 20, стр.4

Сдано в набор 18.03.2013. Подписано в печать 02.04.2013
Формат 60x90¹/₈ Бумага офсетная №1.
Уч.-изд. л. 15,5. Физ. п. 15. Тираж 500. Заказ № 189

ООО Издательство «Янус-К».
127411, Москва, ул. Учинская, д.1

Отпечатано в ООО «Крайф»
127106, Москва, ул. Ботаническая, д.41, п.7

Редакционный совет

Председатель:

Ананян М.А., д.т.н., ген. директор
Концерна «Наноиндустрия»

Члены совета:

Андриевский Р.А., д.т.н., проф., член совета РАН
по наноматериалам; Быков В.П., д.ф-м.н., проф.;
Сергеев Г.Б., д.х.н., проф.;
Цирлина Г.А., д.х.н., проф.;
Четверушкин Б.Н., д.ф-м.н., член-корр РАН;
Левин А.С., отв. секретарь

Номер готовили:

Сапожников Ю.Т., Свидиненко Ю.Г.

PROBLEMS OF INFORMATION IN THE FIELD OF NANOTECHNOLOGIES AND NANOMATERIALS. PLACE OF RUSSIA IN THE WORLD NANOCOMMUNITY

Andriyevsky R.A., Klyucharyova S.V

The journals in the nanotechnology and nanomaterial field are analyzed. The significant increase of specialized journals and papers in classic natural scientific journals is marked. The attention is taken to decrease of the Russian publication activity in last years.

ON SOME MODERN TENDENCIES OF STUDYING PROPERTIES OF NANOMATERIALS (OVERVIEW OF FOREIGN LITERATURE)

Moskvitin G.V., Birger E.M., Polyakov A.N.

The article provides an overview of the various experimental and analytical research methods of nanomaterials. The work reflects World tendencies in this direction.

Are some of the leading firms engaged in research and application of nanomaterials. Shows some of the equipment that is used to study the properties of nanomaterials.

Keywords: nanotechnology, nanomaterial, nanoparticle, nanouroven', nanoindentor, nanocarapanie, nanosklerometr, the test technique.

CARBOXILIZED CARBON NANOTUBES USED AS ACTIVE COMPONENTS OF SENSOR DEVICES

Zaporotskova I.V., Polikarpova N.P., Vilkeyeva D.E., Zaporotskov P.A.

Volgograd state university, Volgograd, Russia, Universitetsky prospect, 100, 400062

Results of research of the mechanism of accession of carboxyl group to open border of a semi-infinite single-walled carbon nanotube «zig-zag» for formation of chemically active sensor are presented. Interaction of the sensor with some alkaline metals is studied. Process of scanning of any surface containing metal atoms or ions was modeled, and activity of functional group –COOH to the chosen element was defined. Calculations were performed using the semi-empirical scheme MNDO within the framework of the molecular cluster model and DFT method. The executed theoretical researches proved possibility of creation of a highly sensitive sensor on the basis of the carboxylated carbon nanotubes.

Keywords: carboxylated carbon nanotube, sensory activity, functional carboxyl group, alkali metals, chemical active probe, semi-empirical scheme MNDO.

STUDYING PHOTO-, AUTOELECTRONIC EMISSION IN NANOGRAINS OF INDIUM ANTIMONIDE AND ARSENIDE

Zhukov N.D.¹, Glukhovskoy Ye.G.², Bratashov D.N.²

¹"Volga-Svet" LLC, Saratov, Russia;

²Saratov State University, Saratov, Russia

Characteristics of field (autoelectronic) emission from nanograins of indium antimonide and arsenide narrow gap semiconductors have been studied by tunneling microscopy method. Coulomb blockade and low field emission phenomena have been detected and explained. Increased photo sensitivity has been noticed for own conductivity semiconductors. It makes them prospective as regards using them as IR photo autocathodes.

TEMPERATURE DEPENDENCE OF HEAT CAPACITY AND HEAT CONDUCTIVITY OF EPOXY MATERIALS MODIFIED WITH METAL/CARBON NANOSTRUCTURES

Artanov A.M.¹, Zagrebin L.D.¹, Mukhametshina I.Yu.¹, Kodolov V.I.^{1,2,3}, Chashkin M.A.³

¹FGBOU VPO «The Izhevsk state technical university of a name of M.T.Kalashnikov», Izhevsk, Russia

²Scientific and educational center of chemical physics and mezoskopiya of UDNTs URO Russian Academy of Sciences, Izhevsk, Russia

³«Izhevsk Electromechanical Plant «Dome», Izhevsk, Russia

Using a dynamic, λ -calorimeter in the temperature range 298–373 K were measured and the results of changes in heat capacity and thermal conductivity of epoxy resins modified with copper / carbon nanostructures. Found a change in thermal and structural properties of modified copper/carbon nanocomposite epoxy polymers.

Keywords: epoxy resin, metal/carbon nanostructures, nanocomposite, specific heat, thermal conductivity.

NANOMODIFIED GALVANIC COATINGS

Dyakov I.A.

Tambov State Technical University, Tambov, Russia

The changes in the properties of the plating deposited in electrolytes containing carbon nanotubes. It is shown that the use of carbon nanotubes CNM «TAUNIT» in electrochemical coatings alter morphology tribological properties and thermal properties of coatings. Varying concentrations of CNM can control the properties of coatings, improving their properties.

Keywords: Electroplating, plating, nanomaterials, carbon nanotubes.

«SILVER NANOPARTICLES – POLYPROPYLENE FIBEROUS CARRIER» BACTERICIDAL SYSTEM: OBTAINING AND PROPERTIES

Malinovskaya T.D., Lysak G.V., Lysak I.A.

The use of polypropylene fibrous material as a carrier for the silver nanoparticles was substantiated. By using of spectroscopic methods the mechanisms of forming nanoparticles on the support surface in two-phasic activation by ultraviolet and microwave radiations were investigated. The process of producing the bactericidal system of «silver nanoparticles – polypropylene fibrous material» was developed. The created system demonstrates high bactericidal activity and could be used for water cleaning from microbiological contamination.

Keywords: silver nanoparticles, polypropylene fibrous material, microwave radiation, bactericidal system.

INDUSTRIAL RARE EARTH LUMINOPHORES FOR EFFECTIVE ENLIGHTENMENT LEDS

Soshchin N.P., Lichmanova V.N., Bolshukhin V.A.

R&PC «Luminophor», Fryazino, Russia

The microcrystalline powders of photoluminophores for LED on the basis of aluminium garnets structure and silicates with structure bredigite were prepared by use of the solid-state technology. For the synthesis were used nanodimension oxides: Y_2O_3 , Al_2O_3 and fluoride salts.

It was shown that the photoluminophores exhibit high quantum output to 96% and ensure the emission in LED in the white spectral region up to 145 lm/W.

Keywords: nanotechnologies, multiligand phosphors, structure garnet, LED, efficiency.

STUDYING POROUS STRUCTURE OF MINERAL-CARBON SORBENTS FOR CHROMATOGRAPHIC SEPARATION OF FULLERENES

Postnov V.N., Krokhina O.A.

Saint-Petersburg State University Chemical Faculty, Saint-Petersburg, Russia

The parameters of the porous structure of the mineral-carbon sorbents (intended for the chromatographic separation of the C_{60} , C_{70} fullerenes) obtained by chemical vapour deposition and cyclic deposition of carbon, by means of the methods of mercury porometry, low-temperature nitrogen adsorption, adsorption of benzene vapour were defined.

It was found that the sorbents have complex porous structure and contain macropores, mesopores (3–6 nm), as well as micropores.

It was shown that increasing the carbon content of mineral-carbon sorbents affects the pore size distribution.

A correlation between the volume of mesopores and C_{70} fullerene output in the process of chromatographic separation of fullerenes in toluene in the gravity mode was determined.

STUDYING MICROSTRUCTURES OF NANOSIZED SALTS OF NYTRATES SUBJECTED TO EXTERNAL PRESSURE

Kuznetsova I.A.

Moscow State University of Environmental Engineering, Russia

The paper presents the results of the research of microstructures of nanoscale salts nitrates, received in the result of seals in the mould. Shows a comparison of nanoscale granules and the initial powders. The analysis of sealing materials.

Keywords: microstructure of nanomaterials, seal, microscopy, defects.

CAPTURING AND TRANSFER OF AIR PORTION BY STEERED FLOW OF NANODISPERSE MAGNETIC FLUID

Bashtovoy V.G., Polunin V.M., Boyev M.L., Ryapolov P.A.

The processes of formation and relocation of an air cavity by the managed flow of nanodispersed magnetic fluid at a various speed mode are discussed. In the approximation of «low-magnetic» environment by finding surfaces of a constant potential of magnetostatic force, the shape of the cavity surface confined by magnetic levitation is studied. Experimental data on the stability of the cavity at a time and its steadiness in relation to pressure from the non-uniform magnetic field are presented. The results of evaluation of the size of bubbles detached from the cavity, received by two different methods, are in adequate agreement with each other.

Key words: a magnetic fluid, a magnetic levitation, a magnetic field, an air cavity, a column of MF, air bubbles, a shape of free surface.

MULTICLUSTER NANOTECHNOLOGICAL SETUP FOR STUDYING AND MANUFACTURING NANOSCHEMES AND FUNCTIONAL NANOSYSTEMS FOR ENERGY SUPPLY SYSTEMS OF SPACESHIPS.

Dubovoy A.N., Rodionov B.N., Yegorov S.D., Mazur S.N., Koroteyev A.V., Stepanov M.V., Khlyustov P.M.

Multi Cluster Nano Technology Complex (MCNTC) with the open architecture is described. Are shown structure and opportunities of transport, technological, analytical modules MCNTC. In MCNTC group plasma technologies of clearing, sedimentation, etching (PC, PECVD, PE, RIE, DLC) and nanolocal zond technologies nanoetching and nanodeposition (NLZPE, NLZCVD) are realized. The modular open architecture, allows to provide flexible automatic control MCNTC and to increase its transport, technological, analytical opportunities. Solving component MCNTC is module «Supercomputer». It allows to organize closed a nanotechnology line – design-center + nanofabric. Module «Supercomputer» will allow to model and project microstructures, nanoelements, nanocircuits, functional nanosystems, MEMS, NEMS which can be made on MCNTC.

ELECTRORHEOLOGICAL EFFECT IN POLYDIMETHYLOXANE SUSPENSION OF TITANIUM DIOXIDE-POLYPROPYLENGLYCOLE NANOSIZED HYBRID MATERIAL

Agafonov A.V., Krayev A.S., Davydova O.I., Zakahrov A.G.

G.A.Krestov Institute of Solution Chemistry of Russian Academy of Sciences, Ivanovo, Russia

Electrorheological effect in suspensions with nano-sized powders of inorganic-organic hybrid material titanium dioxide-poly(propylene) glycol as filler was studied in polydimethylsiloxane. The content of the dispersed phase was 15 and 30 percent per volume. Description of apparatus for the measurement of electrorheological effect by the tensile stress-compression electrorheological fluid in electric fields up to 5 kV/mm was given. 30 vol % suspension hybrid material titanium dioxide-poly(propylene)glycol in the polydimethylsiloxane has a yield stress of 60 kPa in the electric field 4 kV/mm.

Keywords: electrorheological effect, electrorheological fluid, hybrid inorganic-organic nanomaterials, electric field influence.