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## **IMPROVING MANUFACTURING TECHNOLOGY OF MULTILIGAND PHOTO LUMINOPHORES FOR EFFICIENT ILLUMINATING LEDS**

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

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The Synthesis of aluminate photophosphors with garnet structure is considered. It was offered nanotechnology method synthesis of these materials with using of different the ligand additives that allows to operate as the key to provide the variation of phl spectral and power parameters. It was shown that at variation of ligands in the aluminium garnet structure are obtained the photophosphors for LEDs of neutrally white color with light output to 142 lm/w and warm-white to 127 lm/wt.

*Keywords:* nanotechnology, photophosphor, multiligand. light-emitting diode (LED).

## **MICRO EQUIPMENT FOR STUDYING NANOSCALE PARTICLES OF METALS**

***Skladnev D.A., Sorokin V.V., Kulikov E.E., Imametdinova D.G., Galchenko V.F.***

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Technic for laboratory micromanipulations allowing simplifying and accelerating carrying out research for preparation of nanoparticles by green synthesis is offered. Prospects of use of the integrating sphere are shown at spectrometry of silver nanoparticles which are forming directly in cultures of bacteria producers of reduction agents.

*Keywords:* Nanoparticles, green synthesis, laboratory micromanipulations.

## **UTILIZING ALUMINIUM SHAVINGS BY PRESSING USING TITATIUM NITRIDE POWDER**

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The technology of making the finished product by pressing the composition consisted of the aluminum alloy chips and the nanopowder of aluminum nitride is described

*Keywords:* aluminum chips, nanopowder of aluminum nitride, recycling, pressing, finished product

## **MULTI-COMPONENT NANOPARTICLES OF METALS AS PRECURSORS OF NOVEL ANTI BACTERIAL MATERIALS**

***Lerner M.I., Glazkova E.A., Domashenko V.V., Timofeev S.S., Pervikov A.V., S.G. Psakhie***

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The morphology, phase and elemental composition of multi-component nanoparticles produced by parallel electrical explosion of two twisted conductors – Al and Zn, Cu and Fe were studied. It was established that two-and three-component nanoparticles with metallic phases being in direct contact during wire electrical explosion under argon and nitrogen are formed. When reacting the nanoparticles of Al/Zn, Al/Cu, Al/AlN/Cu, AlAlN/Zn and Al/AlN/Fe with water, complex agglomerate structures of aluminum oxyhydroxide nanoplates with the second metal of Cu, Zn, Fe or their compounds with antibacterial properties are formed.

*Keywords:* multi-component nanoparticles, reaction products, antimicrobial activity.

**STRUCTURAL TRANSITIONS IN THIN LAYERS OF PEPTIDE  
COMPOSITE MATERIALS WITH SILVER AND GOLD NANOPARTICLES:  
INFLUENCE OF TEMPERATURE AND HUMIDITY**

***Loskutov A.I., Loginov B.A., Oshurko V.B., Romash E.V., Kosheleva N.V., Falin A.V.***

The processes of structural transformations during crystallization of peptides and peptide composites with nanoparticles of silver and gold from aqueous solutions were studied by scanning probe and optical microscopy. Crystallization of peptide layers is rather complex and multi-stage process. At the initial stage it is limited by the rate of diffusion of the peptide chains or metal nanoparticles to the front of the crystal growth under nonequilibrium conditions. The result is the formation of nonstable fractal structures. On the next stage the process of structural relaxation of the crystallized peptide layers begins in more equilibrium. In the process of structural relaxation of the crystallized peptide layers (aging in moist air at room temperature) peptide chains migrate along the surface to the outer boundary of the growing crystal and fix to the centers with a minimum free energy. The result is a more stable peptide structures that retain their morphology for a long time. The presence of metal nanoparticles in the peptide matrix accelerates the process of structural relaxation of the layers. In contrast to the structural relaxation of polymers in the case of peptide layers the increase in temperature up to 100°C and more has almost no effect on this process due to water desorption from its surface and the lack of mobile peptide chains. The presence of metal nanoparticles in the peptide matrix significantly changes the morphology of the composite layer. The increase of humidity accelerates the slow relaxation of composite layers.

**STUDYING ANISOTROPY AND DOMEN CONDITION OF PERMALLOY THIN FILMS**

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With the help of a vibration magnetometer it is measured the hysteresis loop of thin permalloy films with the thickness 1,5; 3,0; 4,5, 6, and 10 nm which were obtained by magnetron sputtering of an alloy Ni<sub>81</sub>Fe<sub>19</sub>. It is revealed that at increase in thickness of a film from 3 to 10 nanometers the coercive force ( $H_C$ ) increases. In the direction perpendicular axes of easy magnetization the loop form considerably differs from rectangular that is caused by amplitude dispersion of anisotropy. The films received in a scattered field of Earth are isotropic on magnetic parameters. Results of the atomic force microscopy are indicated a granular structure of films, and confirm existence of not magnetized areas in the studied films. Critical thickness at which permalloy films pass from a multidomain state to single-domain are about 10 nanometers. Estimates of critical thickness of transition from an single-domain state to the superparamagnetic resulted 1,5–2 nanometers in values.

*Keywords:* thin permalloy films, magnetometer, hysteresis loop, coercive force, single-domain particles, superparamagnetic state.

**SIMULATING ELECTROOPTIC EFFECT IN COLLOID OF MAGNETITE NANOPARTICLES**

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A model of the effect of varying the transparency of the colloidal solution of magnetite nanoparticles in kerosene by pulsed electric field are created. Shows the effect of the optical parameters of the near-electrode effect of space charge and concentration wave of magnetic nanoparticles. Found that to properly explain the features of the optical effect in the sheath must take into account the polydispersity of magnetite nanoparticles and their aggregates.

**USING NANOSILVER FOR OBTAINING  
ANTI MICROBE POLYESTHER TEXTURIZED FILAMENTS**

***Arishina I.V., Sosin A.N., Andreyeva T.I.***

The study describes the results of the polymer concentrate effect, which contains nanoscale silver, to the process of antimicrobial polyester textured yarn getting.

The principal possibility of antimicrobial polyester textured yarn getting is shown by using existing industrial equipment without significantly changing technological modes of production. The resulting polyester textured yarn satisfy the basic characteristics requirements for yarns textile industry and have a prolonged antimicrobial effect.

*Keywords:* technology, antimicrobial additives, concentrates, anti-microbial yarn nanosilver.

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**LIMIT DEFORMATIONS AT MANUFACTURING METAL-MATRIX NANOCOMPOSITE  
SUPER CONDUCTIVE ARTICLES FOR INTERNATIONAL  
THERMONUCLEAR EXPERIMENTAL REACTOR (ITER)**

***Kolmogorov H.L., Snigireva M.V., Chernova T.V.***

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In article the method of determining the ultimate strains by superconductor production. The method allows to ensure the preservation of the strength of the low-temperature composite superconductors in the manufacturing process. The influence of main technological parameters.

*Keywords:* a composite superconductor; ultimate strains; multistage drawing; transversely isotropic solid.

**STUDYING CHARACTERISTICS OF ARMCAP-W TYPE NANOFUID  
AND APPLICATION PROSPECTIVE FOR SUCH PRODUCTS**

***Trukhina M.V., Mokochunina (Gnatyuk) T.V., Kuzmin M.O., Provotorov M.V.***

The main characteristics of liquid nanodispersion ArmCap-W (produced by «Advanced technologies») were studied. It has almost deagglomerated particles that are part of it compound: nanodiamonds with average size 4 nm and multilayer carbon nanotubes with average external diameter 1  $\mu\text{m}$ . Total deaggregation of nanoparticles is necessary for realizing of processes that allow to make their compacting more tight and processes of hardening modification of different materials by this particles. Such a kind of modification occurs at the lowest concentration of nanoparticles (about 1 ppm), that is not changes plasticity and lot of other characteristics of modifying matrix.

*Key words:* carbon nanoparticles, nanodiamonds, carbon nanotubes, electronic microscopy, agglomerate, agglomeration, segregation, nanomodificator, hardening modification, matrix.

**SIMULATING GOLD NANOPARTICLES COALESCENCE PROCESS  
BY MONTE-KARLO METHOD**

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Novozhilov N.V., Khashin V.A., Sokolov D.N.***

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The simulation of the coalescence process of gold nanoparticles for different initial configuration by Monte-Carlo method was carried out. The interaction between nanoparticles was described by many-body Gupta potential. It was determined that in some cases the nanoparticles coalescence could happen under much lower temperatures than the temperature of crystal-liquid phase transition for the current size of nanoparticles. Moreover, the coalescence doesn't happen at all at certain distances between nanoparticles of an initial configuration. The evolution of the neck formed at the coalescence of different-sized particles was investigated.

*Keywords:* Gold nanoparticles, coalescence, Monte-Carlo method, Gupta potential, phase transition, neck.

**MEASURING REFRACTION INDEX OF ALCOHOL NANOSCALE FILM**

***Kim D.A., Sdobnyakov N.Yu., Novozhilov N.V.,  
Antonov A.S., Sokolov D.N., Voronova E.A.***

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On the basis of analyzing the spectrum of the ellipsometric angles and the investigation of thickness dependences of refractive index for nanosized ethanol film on silicon and glass surface using the photometric spectral ellipsometer was carried out.

*Keywords:* Ellipsometry, ethanol, nanosized film, index of refraction.

**ON INFLUENCE OF LIQUID CUP FORM BETWEEN TWO SPHERICAL NANOPARTICLES UPON DIMENSIONAL DEPENDENCE OF THERMODYNAMIC CHARACTERISTICS**

***Sdobnyakov N.Yu., Kolosov A.Yu., Dokolov D.N., Antonov A.S., Bazulev A.N.***

On the basis of thermodynamic perturbation theory the calculations of the excess free energy and disjoining pressure for the liquid neck between two spherical nanoparticles have been carried out using different approximations for the neck form. In terms of disjoining pressure the liquid neck stability has been analyzed.

*Keywords:* Neck, excess free energy, disjoining pressure.

**ON SIMULATING THERMAL EFFECTS AT INTERACTION OF SCANNING TUNNELING MICROSCOPE WITH A SAMPLE**

***Sokolov D.N., Sdobnyakov N.Yu., Kutilin P.S., Novozhilov N.V., Mikhailova O.V., Antonov A.S.***

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Monte-Carlo method using many-body potential Gupta simulated evaluation of the interaction between probe tip (copper) – sample (gold) system in the thermal expansion as a function of distance between them. Simulation have been carried out for two configurations of the probe tip: a rod and a cone. It is found that the thermal expansion of the probe tip can reach values comparable with the width of the tunneling gap and the potential for a cascade process of thermal expansion of the probe tip exists that results in contact between the probe and the sample surface.

*Keywords:* Scanning tunneling microscopy, a tunnel junction of the cuprum-gold, thermal expansion of the probe, Monte-Carlo method, Gupta potential.

**NANOMATERIALS IN PRODUCTION OF CONSTRUCTION CONCRETE**

***Puzach V.G., Shustrov N.N., Shitikov Ye.S., Mokhnatov G.Yu., Karlov S.P., Chervyakov M.V.***

There are showing the results of the study to enhance the operational properties of concrete. The positive effect is dependent on the amount of introduced additives and their chemical structures, activation of the water, cement type, ultrasonic processing of the cement sand.

*Keywords:* concrete, nanomodifiers, activation, cement paste, hydration, ultrasound

**INFLUENCE OF LOCAL PHONON MODES OF BROAD BAND MATRIX UPON TUNNEL VOLT AMPERE CHARACTERISTICS FOR STRUCTURES WITH QUANTUM DOTS IN COMBINED AFM/STM SYSTEM**

***Krevchik V.D., Semyonov M.B., Zaitsev R.V.***

Model of 1D dissipative tunnelling for interpreting tunnel volt ampere characteristics obtained in experiment on visualization of local states in InAs/GaAs quantum dots by method of combined AFM/STM has been developed. It has been found out that influence of two local modes of broad band matrix upon probability of 1D dissipative tunneling causes origination of several non-equidistant peaks of corresponding field dependence.

It has been demonstrated that theoretical dependence matches experimental volt-ampere characteristic of AFM probe contact to InAs quantum dot surface qualitatively.

*Keywords:* quantum tunneling with dissipation, quantum dots, volt-ampere characteristics