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PLANAR TEMPLATES BASED ON PHOTOSENSITIVE NANOCOMPOSITE THERMOPLASTIC LAYERS

Zabolotny M.A., Grinko D.O., Barabash M.Yu., Kulish N.P., Dmitrenko O.P.

Technique for photosensitive nanocomposite template manufacturing in electrophotographic process have been elaborated. Space modulation of relief and trapped charge performed by means of optical holography technique in electrophotographic process. AFM and optical microscopy indicates that nucleation of gold nanoclusters occur in regular spots on the surface of template in accordance with exposure light field.

Keywords: template, electrete, optical holography, electrophotographic process, selforganisation.

OBTAINING METAL/CARBON NANOCOMPOSITES AND STUDYING THEIR STRUCTURAL FEATURES

Trineeva V.V.,¹ Vahrushina M.A.,² Bulatov D.L.,¹ Kodolov V.I.³

The possibility of different metal/carbon nanocomposites obtaining with changes of process conditions is established. The peculiarities of metal/carbon nanocomposites structure are studied.

Keywords: Metal/carbon nanocomposite, Raman spectroscopy, nanoreactor, Transmission electron microscopy, isomeric series.

INTENSIFYING HEAT EXCHANGE BY MEANS OF VARYING SURFACE ROUGHNESS BY NANOMODIFIED ELECTRO CHEMICAL COATINGS.

Gravin A.A.¹, Mukhin R.Yu.¹, Litovka Yu.V.¹, Dyakov I.A.¹, Stolyarov R.A.²

¹ *Tambov state technical university, Tambov, Russian Federation*

² *Tambov state university named after G.R.Derzhavin*

Possibility for change roughness for heat-exchange intensification have considered. Appropriateness of the use of nanosized materials to achieve this goal have justified in detailed and positive outcome of their application have detected. Heat emission from nano-modified zinc surfaces to the water environment and heat emission from nano-modified oxidized surfaces to the air environment was investigated.

Keywords: Electroplating processes, heat transfer intensification, roughness increase, carbon nanotubes, inverse problem of nonstationary heat conductivity.

ENERGY SAVING TECHNOLOGY OF OBTAINING SUBMICRON POWDERS WITH MECHANICAL DESTRUCTION METHOD

Zhirov D.K., Trineeva V.V.

Institute of Mechanics Ural Branch of the Russian Academy of Sciences, Izhevsk, Russia.

In article obtaining opportunity of submicron powders by using mechanical-milling method in multi-step mill have shown. Comparative analysis of received powders from centrifugal separator and sieving machine for identify chemistry, morphology of received material particles have done.

Keywords: multi-step mill, submicron powder, aluminium slag, mechanical milling.

ELECTRICAL AND PHOTO VOLTAIC PROPERTIES OF NANOSTRUCTURED SILVER–PALLADIUM RESISTIVE FILMS

Mikheev G.M., Zonov R.G., Saushin A.S., Dorofeev G.A.

The results of the investigation of morphology, phase composition, electrical and photovoltaic properties of nanostructured silver-palladium conductive thick-films made of resistive pastes LPR-5 and LPR-50 Ohm at three different firing temperatures (878, 1013 and 1113 K) are presented. It is shown that the films consist of nanostructured porous material of AgPd, PdO, Ag₃O and Ag₂O. It was revealed that films made of pastes LPR-5 and LPR-50 Ohm are *n*- and *p*-type conductors, respectively, and they have significantly different values of the carrier concentration, mobility, and resistivity. The highest efficiency of laser power to the photovoltaic signal amplitude conversion occurs in the films made at a firing temperature 878 K.

ON SOFTWARE FOR SIMULATING NANOOBJECTS

Mikhaylov I.S.

Ulyanovsk State University, Ulyanovsk, Russia

The review of free software for modeling of nanoobjects is given in this article and described the possibility of use CAD-, CAE-systems for modeling of properties of nanosystems by several methods. Some researches have been spent by modifications of open initial code of software Nanoengineer-1. The integration of nanomodels with CAD-, CAE-systems is realized by format STEP. The acceleration of the method of molecular dynamics is realized by use of potential of the interatomic interaction based on orthogonal finite functions.

PHYSICAL AND CHEMICAL METHODS OF MODIFYING SECONDARY BUTYRAL RESIN FOR ENHANCING COMPLEX OF MECHANICAL PROPERTIES.

***Burmistrov I.N., Gorokhovskiy A.V., Panova L.G.,
Yusupov Kh.U., Yudin A.G., Gorshenkov M.V., Ilyinikh I.A.***

The properties of composite materials for coatings based on modified with silicate and phosphoric acid and filled with potassium polytitanates polyvinyl butyral were studied in this paper. The structure, chemical composition and particle size distribution of selected fillers were investigated. The effect of modifying on the mechanical properties of polyvinyl butyral was established, and the presence of the chemical interaction between the polyvinyl butyral and ethyl silicate were showed. The structure of the composites was investigated by scanning electron microscopy. A significant increase even distribution of filler, size reducing and size variation of pores in the binder and increasing of mechanical properties of composites obtained by mixing with mechanical activation compared to simple mixing were found.

Keywords: polymer composite material, polyvinyl butyral potassium polytitanate, modification, dressing.

NON-TRADITIONAL TRIBOTECHNICS AND NANOTRIBOPREPARATIONS

Dunaev A.V., Soloviev R.U.

Examples of efficacy, a problem in wide application.

Keywords: triboadditives, a resource, a friction coefficient.

SYNTHESIS OF ULTRA DISPERSE PHASES BASING ON CARBON AND NITROGEN

Sivkov A.A., Pak A.Ya., Nikitin D.S., Rakhmatullin I.A., Shanenkov I.I.

National research Tomsk polytechnic university, Tomsk, Russia

The results of studies on the direct plasmodynamic synthesis of ultradisperse structures in the C-N system are presented. According with X-ray diffraction analysis data and electron microscopy the product contains a phase close to the calculation model of carbon nitride $\alpha\text{C}_3\text{N}_4$.

INFLUENCE OF IONS, NANO- AND MICRO PARTICLES OF IRON UPON LUMINESCENCE AND GROWTH OF *Escherichia coli* RECOMBINANT STOCK WITH CLONED *Photobacterium leiognathi lux*-OPERON IN ACUTE AND LONG-TERM TOXICITY TEST

Kondakova K.S., Deryabina T.D.

Acute and chronic toxicity of irons, nano- and microparticles of iron were examined by bioluminescent method, using cells of the recombinant strain *Escherichia coli* K12 TG1 with the cloned genes *luxCDABE* in it - natural luminescent marine bacteria *Photobacterium leiognathi*, and by measuring the growth dynamics of the corresponding test strain.

In a direct test the iron ions exert a signified acute toxicity by the 1st hour of research which increase to 16 hours. The development of iron nanoparticles toxic effects requires a longer exposure ($EC_{50} = 13,9 \pm 0,70$). Microparticles of iron manifests itself as a non-toxic compound in the whole dynamics.

During cultivation of bacterial fluorescent biosensor in LB-broth, a detectable toxicity of iron was significantly lower. The toxicity of iron nanoparticles characterized as $EC_{50} = 14,1 \pm 0,80$ per 16 hours of contact. Microparticles of iron did not cause inhibition of bacterial luminescence.

During the investigation of growth of the recombinant strain *E. coli* K12 TG1 in batch culture the iron toxicity is characterized by the value of $EC_{50} = 9,8 \pm 1,20$, and nanoparticles – $EC_{50} = 14,0 \pm 2,30$ per 16 hours of exposure. Microparticles of iron did not cause inhibition of growth of the recombinant strain.

Keywords: nanoparticles, microparticles and iron ions, *Escherichia coli*, bioluminescence.

MORPHOLOGY AND BIOLOGICAL ACTIVITY OF NANOSYSTEMS BASING ON SELENIUM NANOPARTICLES

Valuyeva S.V., Azizbekyan S.G., Kuchinsky M.P., Nabiullin A.R., Sukhanova T.E.

Structural-morphological parameters of the selenium containing nano-systems stabilized by polyvinylpyrrolidone have been studied. The area of saturation of adsorption capacity of nanoparticles of selenium, a form and dimensional characteristics of nanostructures have been found. Low toxicity, high biological activity and a durable action of preparations on the basis of nano-selenium have been found.

Keywords: nano-particles of selenium, nano-structure, structural-morphological parameters, biological activity.

NANOMODIFIED COMPOSITE FOR CONSTRUCTION PURPOSES BASING ON EPOXY ANHYDRIDE BINDING AGENT

Belyaeva E.A., Natrusov V.I., Osipchik V.S., Shatskaya T.E., Ananyeva H.S., Zhirkov E.P., Vasilyeva A.A., Bochkarev A.C.

The present thesis represents researches reference of little amount of additives of nano-materials (NM) of carbonic and silicate types on service properties of epoxyanhydride compositions (EC) as well as method of injection of the mentioned NM and EC which would provided uniform distribution of nano – particles in EC including preparation of colloidal solutions of silicate NM in the ingredients of EC.

A considerable positive effect was established in the result of nanomodification of EC by the indicated NM, it being established that modification of EC with silicate NM is preferable taking into account criterion “ price – quality”.

Keywords: carbonic and silicate nano-modifiers, epoxy binders, ultrasound treatment, physical and mechanical characteristics, textural features (spherulites).

INFLUENCE OF INDUCED MAGNETIC ANISOTROPY UPON MAGNETIC LOSSES OF AMORPHOUS ALLOYS BASING ON FE AND COMPANYY.

Shulika V.V., Potapov A.P.

Institute of Metal Physics, Russian Academy of Science, Ekaterinburg, Russia.

The effect of annealing temperature, cooling rate, the frequency of the magnetic field for thermomagnetic treatment on the magnetic hysteresis losses and characteristics of based on Fe and Co-based amorphous magnetic alloys are studied. It is shown that in these alloys with different magnetostriction, there are different regularities of changes in magnetic properties induced by the effect of magnetic and magnetoelastic anisotropy. The conditions of thermomagnetic treatment of soft magnetic amorphous ribbons on Fe and Co-based of Fe and Co, which provide the highest magnetic properties are defined.

STUDYING EFFECTIVENESS OF MICRO FERTILIZING AGENTS BASING ON NANOPARTICLES OF BIO ELEMENTS.

Azizbekyan S.G., Nabiullin A.R., Domash V.I.

Microfertilizers based on nanoparticles of cobalt, manganese, copper and iron were investigated. The results indicate that nanoparticles are more effective than microelements in saline and chelated form.

Keywords: nanoparticles, cobalt, manganese, copper, iron, microfertilizers

OBTAINING NANOPARTICLES OF BIO ELEMENTS FOR CREATING THE PREPARATION FOR STIMULATING HEMAPOIESIS OF ANIMALS.

Azizbekyan S.G., Nabiullin A.R., Kuchinsky M.P., Nikolayenko S.A., Kuchinskaya G.M.

The methods for the synthesis of nanoparticles of iron, cobalt and copper in the form of stable colloidal solutions were developed. The size of the nanoparticles of bio-elements was controlled using transmission and scanning electron microscope. It was found that nanoparticles are less toxic than salt of microelements.

Keywords: nanoparticles, iron, cobalt, copper, veterinary

INFLUENCE OF POLYVINYL ALCOHOL ADDITIVES UPON ELECTRO CHEMICAL AND ELECTRO PHYSICAL PROPERTIES OF COMPACTED NANOPOWDERS OF PROTON-ENRICHED POTASSIUM POLYTITANATE

Gorokhovskii A.V., Goffman V.G., Orozaliyev E.E., Kovnev A.V., Arkhipova N.V.

Yu.A.Gagarin Saratov State Technical University, Saratov, Russia

The impedance-spectrometry was applied to investigate the influence of the poly(vinyl)alcohol content on electrophysical properties of the compacts obtained in the system of PVA-hydrated potassium polytitanate (HPPT) at room temperature in the frequency range of 1 Hz–1 MHz. It was shown that the additives of 1–10 wt.% did not influence the permittivity and dielectric losses at low (1–10 Hz) and high ($5 \cdot 10^5$ – $2 \cdot 10^6$ Hz) frequencies. In the intermediate range of frequencies even low PVA admixtures reduced electric conductivity. The detected effect is explained by intensive dielectric losses related to the blocking of the electric charge transport channels of the potassium polytitanate particles with the PVA molecules. It was shown that an increase of the PVA content in the composition of the PVA-HPPT compacts promoted increased high frequency permittivity of the compacts.

Key words: compacted nanopowders; solid state electrolytes; potassium titanate; poly(vinyl)alcohol, electro-physical properties.

STABILIZING ARRAYS IN ION METALS WITH THE HELP OF NANOPOWDERS

Krushenko G.G.

Institute computational modeling SB RAS, Krasnoyarsk

Introducing the nanopowders into the molten metal during the process of producing the cell structure prevents implosion and precipitation of foam and it also strengthens the metallic foam}

Key words: metallic foam, nanopowders, stabilization cells, strengthens foam.