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## ABSTRACTS OF PUBLISHED ARTICLES

UDC 669.15–194.621.039.536.2:539.4

**Opportunity of maintenance of category strength КП-45 in large-sized blanks out of steel 15X2MΦA with thickness of a wall up to 490 mm for vessels of NPP.** Zotova A. O., Teplukhina I. V. – Voprosy Materialovedenia, 2010, N 2(62), p. 5–18.

Is shown the opportunity of receiving of strength level corresponding to category of strength КП-45, and  $T_{к0} \leq -35^\circ\text{C}$  in semifinished items out of steel 15X2MΦA-A by thickness for heat treatment up to 490 mm due to optimization of steel structure, application of precision forging regimes and heat treatment. Experience of manufacturing of large-sized blanks with thickness of wall up to 490 mm out of steel 15X2MΦA-A of advanced composition (15X2MΦA-A mod. is presented.) with maintenance of category of strength КП-45 and critical brittle temperature below minus  $35^\circ\text{C}$ .

*Key words:* vessel steel, large-sized blanks, category of strength, critical brittle temperature.

UDC 537.63

**About extreme behaviour of material properties of after influence of impulses of low magnetic field.** Datsko O. I., Nedybaljuk A. F. – Voprosy Materialovedenia, 2010, N 2(62), p. 19–24.

The work is devoted to the effect of extreme change of the level of properties, observed in the group of standards of one material, influenced by the impulses of the weak magnetic field on each current model with the gradually increasing size of intensity of magnetic field.

The verification of the supposition that the extreme change can be conditioned not only by the optimum mode of IWMMF, but also by initial structural state of material in the standards is realized.

Thus, if nearby standards in the group have in one case identical enough, and in the other - different enough levels of the initial structural state of material, after influence of IWMMF on them, – the extreme changes can take place accordingly not more than once and more than one time.

*Key words:* impulses of low magnetic field, extreme change of properties level, structured condition.

UDC 669.017.11

**Mathematical modelling for double diagrams of congruent type condition.** Halikov A. R. – Voprosy Materialovedenia, 2010, N 2(62), p. 25–34.

One of the problems of constitution diagrams prognosis is considered – the determination of eutectic concentration of binary constitution diagrams. The suggested scientific approach allows to determine the chemical composition of binary and multicomponent eutectic system. Based on the suggested pattern the eutectic components are calculated as constant quantities of the elements. A comparison of the results of the numeral modeling with the natural experiments data has been carried out based on the examples of particular eutectic alloys.

*Key words:* eutectic concentration, constitution diagram, modeling, eutectic component.

UDC 669.71:621.745.5:621.9.048.7

**The investigation of ultra-fine grained aluminum alloy 1421 melting under laser pulse irradiation.** Kikin P. Yu., Perevezentsev V. N., Rusin E. E. – Voprosy Materialovedenia, 2010, N 2(62), p. 35–39.

The results of the studies of the process of the melting ultrafine-grained (UFG) aluminum alloy 1421 (the size grain  $\sim 1 \mu\text{m}$ ) under the action of laser pulsed radiation are presented. The times of the melting process beginning was registered as a moment of change of the intensity of reflected from surface sample pulse of the laser radiation. Beginning of melting is characterized by sharp increase absorbing abilities of the material and, accordingly, reduction of the reflected signal.

It is shown, that the processes of the melting and evaporations under laser heating at density of the energy flow not exceeding  $\sim 2,4 \cdot 10^2 \text{ J/sm}^2$ , in UFG alloy begins earlier and require smaller energy, in contrast with coarse grain alloy (with grain size 10–30  $\mu\text{m}$ ). The annealing essentially influence upon shift of the melting process beginning point UFG alloy under pulsed laser. Time of the melting beginning increase with increase of annealing temperature.

*Key words:* ultrafine-grained aluminium alloy, laser pulse radiation, temperature of anneal.

UDC 678:539.21

**The structural analysis of nanocomposites polymer/organoclay microhardness.** Dzhangurazov B. Zh., Kozlov G. V., Malamatov A. Kh. Mikitaev A. K. – Voprosy Materialovedenia, 2010, N 2(62), p. 40–44.

Within the frameworks of fractal model the structural analysis of microhardness and yield stress ratio for nanocomposites polymer/organoclay was performed. It has been shown that this ratio is defined by nanocomposites structural state only, in its turn characterizing by their structure fractal dimension. It is significant that the empirical Marsh equation gives better correspondence with experiment than more strict Hill equation.

*Key words:* nanocomposite, organoclay, microhardness, yield stress, structure.

UDC 621.763:621.762.5:669.27

**Synthesis and mechanical properties W-HfC composite materials.** Klimova O. G, Nesmelov D. D. – Voprosy Materialovedenia, 2010, N 2(62), p. 45–50.

Technology of synthesis refractory composites is developed for W-HfC materials with using tungsten nanoparticles for activated sintering. Mechanical testing of sintered materials was done at room and high (1550°C) temperatures.

*Key words:* refractory composites, tungsten, activated sintering, tungsten nanoparticles, high temperature mechanical properties.

UDC 678.742.2:533.924

**Influence of plasma processing on structure and properties of high modular polyethylene fibres.** Sergeeva E. A. – Voprosy Materialovedenia, 2010, N 2(62), p. 51–57.

Is effected processing of high-strength high modular polyethylene fibres by high-frequency cap digit. Is established the optimum regime of the processing, allowing to activate a surface without deterioration of internal structure of fibre. Is received the extralight high-strength composite material.

*Key words:* high-strength high modular polyethylene fibres, plasma processing, extralight high-strength composite material.

UDC 678.746.222:539.411.5

**Receiving of shockproof polystyrene splitting-resistant in cyclopentane.** Lifanov F. D., Arkhireev V. P. – Voprosy Materialovedenia, 2010, N 2(62), p. 58–63.

Are studied physico-mechanical properties of shock-resistant polystyrene received by co-graft polymerization of styrene on a mix of butadiene and butadiene-acrylonitrile rubbers.

*Key words:* shock-resistant polystyrene, splitting-resistance in cyclopentane.

UDC 621.762.2

**Development of technological approaches for receiving of nanostructured composite powders by method of ultrafast machining synthesis.** Marennikov N. V., Gerashchenkov D. A., Burkanova E. Y., Samodelkin E. A. – Voprosy Materialovedenia, 2010, N 2(62), p. 64–67.

Is offered the approach to creation of nanostructured powder materials of system metal-ceramics. Is shown perspectivity of method universal disintegrator-activating process for creation of composite powders. On the basis of the received powders have been created coatings by method of cold gas-dynamic spraying. Hardness of such coatings achieved value 3,3 GPa in comparison with hardness of coatings on the basis of usual aluminium equal to 0,8 GPa.

*Key words:* nanostructured powder materials, disintegrator-activating process, method of cold gas-dynamic spraying, hardness of coatings.

UDC 621.793.7:621.762.2

**Creation of controlled nanostructure in a coating received by methods of gasthermal spraying.** Sholkin S. E., Yurkov M. A. – Voprosy Materialovedenia, 2010, N 2(62), p. 68–74.

The recent study deals with the comparison of nanopowders granulation methods: spray drying and granulation with the use of association material in order to obtain the nanostructured powder. The fact that particles obtained by spray drying have spherical shape and the output of granulation with the use of

association material has splintery shape is shown. Also all the particles appear the agglomerate of particles of nanosize and super-nanosize (up to 300 nanometers). The microplasma spraying of obtained powders is performed, the size of nanostructural powder element retained.

In order to produce the nanostructured coating with enhanced properties the new technology of spraying the functional-gradient coating with the use of two powder feeders is developed. The coating with the gradient of Al–Zn–Sn and sub-micron sized alumina content is sprayed. This coating allows raising the hardness level from 60 HV up to 340 HV. This coating was used for spraying the wear and corrosion protective coatings and to produce and restore the internal-combustion engine

*Keywords:* microplasma spraying, nanostructured powder, nanostructured coating, functional-gradient coating.

UDC 669.15'786–194:621.791–112.81

**Development and research of material for machine welding of hull structures from nonmagnetic high-strength nitrogenous steel.** Kalinin G. Y., Bishokov R. V., Melnikov P. V., Berezovskaja L. A., Mogilnikov V. A., Volkov S. A. – *Voprosy Materialovedenia*, 2010, N 2(62), p. 75–82.

Is developed the base composition and are carried out researches of the material intended for application as added wire for machine welding of hull structures from nonmagnetic high-strength nitrogenous steel.

*Keywords:* nonmagnetic high-strength nitrogenous steel, hull structures, welding materials.

UDC 539.376

**Technique of computational definition of characteristics of creep at the first and second stages on the basis of limited number isochronal curves of creep.** Oryshenko A. S., Popova I. P., Getsov L. B. – *Voprosy Materialovedenia*, 2010, N 2(62), p. 83–95.

Is developed and verified method of computational definition of characteristics of creep on the basis of limited number isochronal curves of creep with reference to any temperature and time, providing the minimal error (minimum meansquare deviations) results of calculation from experimental data; temperature borders of applicability of method are certain.

*Keywords:* method of computational definition of characteristics of creep, isochronal curves of creep, temperature borders of applicability of method.

UDC 621.891:539.538:621.763

**Wear resistance of sintered metallic composites in pair with the molybdenum on friction at sliding current collection.** Aleutdinova M. I., Fadin V. V., Durakov V. G. – *Voprosy Materialovedenia*, 2010, N 2(62), p. 96–103.

Voltage-ampere diagram and wear rate of sintered metallic composites have been determined at sliding current collection without lubricant at sliding velocity 5 m/s and pressure 0,13 MPa. It is shown that sliding of steel based composites on the molybdenum counterbody let to be operable to composites at electric current density less than 70 A/cm<sup>2</sup>. It is established that the alloy Pb–Sn adding in friction zone caused wear resistance increasing of composite-molybdenum sliding electric contact.

*Key words:* sliding electric contact, sintered composite, counterbody, wear rate, friction, friction induced structures.