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## ABSTRACTS OF PUBLISHED ARTICLES

UDC 669.15–194:621.039.536.2:621.73

**Manufacturing process of large-tonnage forgings from low-activated steel of 15X2B2ΦA-A grade.** Rybin V. V., Karzov G. P., Kursevich I. P., Lapin A. N., Berezhko B. I., Romanov O. N., Filimonov G. N., Tsukanov V. V., Bogdanov V. I., Hljamkov N. A., Titova T. I., Shulgan N.A. – Problems of Materials Science, 2007, N 2(50), pp. 5–18.

The main data for processes of melting, forging, manufacturing of shells and heat treatment are submitted, as well results of researches of quality of large billets from low-activated steel of 15X2B2ΦA-A grade, intended for manufacturing of vessels perspective NPP water-to-water type.

*Key words:* low-activated steel, large-tonnage billets melt, forging, manufacturing of bodies, heat treatment, metallurgical quality, structure, mechanical properties.

UDC 669.15–194:621.039.536.2:539.56

**Influence of thermal endurances on critical temperature of brittleness Cr–Mo–V and Cr–Ni–Mo–V steels for vessel of reactors with water under pressure.** Teplukhina I. V., Grekova I. I., Djukov V. V., Savelieva I. G. – Problems of Materials Science, 2007, N 2(50), pp. 19–27.

Thermal endurances on critical temperature of fragility steel of 15X2B2ΦA-A grade, mod. B for vessels of reactors with water under pressure is investigated with the purpose of definition of propensity to thermal embrittlement influence.

*Key words:* reactor with water under pressure, vessels reactor steel, propensity to radiating and thermal embrittlement, critical temperature of brittleness.

UDC 669.14.018.29:621.785.6

**Structure and properties of 30XГCA steel after electro-pulsing hardening with a current of high density.** Maltsev I. M., Kondratiev S. V., Oshurina L. A. – Problems of Materials Science, 2007, N 2(50), pp. 28–34.

Influence of time of influence of high-speed electro-pulsing heating for hardening by a current of high density of  $10^8$ – $10^9$  A/m<sup>2</sup> on structure and properties of structural alloyed steel of 30XГCA grade is considered.

*Key words:* structural alloyed steel, high-speed electro-pulsing heating, a current of high density, structure and properties.

UDC 669.14.018.29:621.785.42

**Thermodynamic, phase transitions and structure carbides in steel. I. Carbides 3d-elements.** Vorobiov Yu. P. – Problems of Materials Science, 2007, N 2 (50), pp. 34–43.

Carbides of the titanium, vanadium and chromium has the solidification temperatures above-mentioned of the Fe (1808 K) and dispersed as single nanoparticles from the melt at beginning of alloy age of the steel. The brief inventory of the results of quantitative metallographic and election microscope, EDX and WDX analyzer suffices to show the growing importance of chemical thermodynamic soling of the carbidoforming processes.

Chemical compositions of carbides in high-speed steel (AISI-M7), vanadium-bearing high manganese stainless steel and in 12Cr–2V–10Mn–5Nb steels are known as well as their structure types M<sub>6</sub>C, MC, M<sub>7</sub>C<sub>3</sub> and M<sub>23</sub>C<sub>6</sub> were determined they compositions and quantity. In using case studies were revealed into solid solutions (Ti<sub>1-x</sub>V<sub>x</sub>) and (V<sub>1-x</sub>Nb<sub>x</sub>)C are co-existed the M<sub>6</sub>C (M ≡ Mo, Cr, W, Fe).

*Key words:* carbides VC, TiC, M<sub>7</sub>C<sub>3</sub>, M<sub>23</sub>C<sub>6</sub>, phase analysis, alloys.

UDC 669.295:621.793.14:620.187

**Structure and phase structure of condensates of the titanium besieged on a steel substrate with a gradient of temperatures.** Firstov S. A., Rogul T. G., Krushinskaja L. A., Stelmah J. A., Bega N. D., Koval A. Y., Kotko A. V. – Problems of Materials Science, 2007, N 2(50), pp. 44–52.

By the methods of the transmission electron microscopy and the X-ray structure analysis it is investigated structure, the phase composition of the condensates of titanium, obtained by the method of cathode-ray evaporation in the vacuum to the steel base layer with the gradient of temperatures of 350–935°C. It is shown that at a temperature of the higher than 876°C in the condensates together  $\alpha$ -titanium is present  $\beta$ -modification of titanium, which is caused by the enrichment of condensates by the diffusing from the steel base layer elements  $\beta$ -stabilizers (nickel, iron and chromium). In this case the microhardness of condensates increases from 1.7–1.8 to 4.2 MPa.

*Key words:* condensates of the titanium, structure, phase structure, microhardness, translucent electronic microscopy, X-ray structure analysis.

UDC 621.793

**Research of the modified superficial layer of steel 35 after electro-spark alloying.** Nikolenko S. V., Potapova N. M., Metlitskaja L. P., Baranov V. A. – Problems of Materials Science, 2007, N 2(50), pp. 53–59.

Modified (with the purpose of increase in heat resistance) superficial layer put on steel by 35 by method of electro-spark alloying is investigated. The received results allow to recommend the coverings created by electro-spark alloying with electrodes CВ-04X19H11M3 + Cr and CВ-04X19H11M3 + Al for modifying surfaces.

*Key words:* electro-spark alloying, modifying of a surface, high-temperature tests, heat resistance, adhesion, coefficient of determination.

UDC 621.778.04:621.785

**Effect of thermal treatment on properties of superconducting wire produced by using the equal-channel multiple-angle pressing.** Matrosov N. I., Chishko V. V., Sennikova L. F., Pavlovskaya E. A., Mironova O. N., Medvedskaya E. A. – Problems of Materials Science, 2007, N 2(50), pp. 60–69.

Effect of thermal treatment temperature on electrophysical and mechanical properties of superconducting wire based on alloy 60T and produced by using the equal-channel multiple-angle pressing has been investigated (ECMAP). Fine structure of the alloy (dimension of coherent scattering regions and level of second-order microstresses has been analysed, thermal stability degree of the structure has been determined. An extraordinary character of changes in the content of secondary  $\alpha$ -phase under thermal treatment ( $T = 300$ – $450^\circ\text{C}$ ,  $\tau = 1$  h) is noted. It results from a characteristic kinetics of phase nucleation, precipitation, dissolution and growth for the obtained structural state of the alloy. Characteristics of microhardness, ultimate strength, relative elongation, specific electrical resistance and critical-current density of bimetallic wire have been determined after thermal treatment in the 300–450°C temperature range. Rational conditions (400°C) of thermal treatment have been selected. A combined deformation involving the ECMAP and thermal treatment gives a 60–80% increase of the critical-current density and improves the mechanical properties of the superconducting wire. The nanograin boundaries and nanodispersive  $\alpha$ -phase precipitation are the effective pinning centres.

*Key words:* superconducting alloy, equal-channel pressing, deformation, thermal treatment, temperature, properties, nanostructure,  $\alpha$ -phase, critical current.

UDC 669.018.25:661.665.2:621.762

**Hard alloys with use of carbonitrides.** Panteleev I. B., Ordanjan S. S. – Problems of Materials Science, 2007, N 2(50), pp. 70–79.

The group of hard alloys is developed, appreciable increase of mechanical and operational properties is achieved without application of expensive nitride coatings. It is carried out due to introduction of nitrogen bearing phases – complicated carbonitrides  $\text{Me}_{1-x}\text{W}_x\text{C}_{1-y}\text{N}_y$ .

*Key words:* cutting tools, alloys with adjustable structure, hard alloys, nitrogen bearing phases, carbonitrides.

UDC 678.7:539.412

**Research of kinetic destructions of structural polymeric materials in conditions of single axis tension.** Erenkov O. J., Gavrilova A. V., Bashkov O. V. – Problems of Materials Science, 2007, N 2(50), pp. 80–87.

With the purpose of development of approaches to forecasting durability, reliability and service life of the products from structural polymeric materials kinetic processes of destruction and deformation in conditions of single axis tension are investigated.

*Key words:* structural polymeric materials, method of acoustic emission, test on single axis loading, mechanical properties.

UDC 669.15–194:621.039.536.2:539.5

**Influence of a neutron irradiation on strength, plasticity and toughness of small activated vessel steel of 15X2B2ΦA-A grade.** Rybin V. V., Karzov G. P., Kursevich I. P., Lapin A. N., Smirnov V. I. – Problems of Materials Science, 2007, N 2(50), pp. 88–100.

Influence of a neutron irradiation on service properties of tungsten bearing small activated vessel steel of 15X2B2ΦA-A grade of industrial manufacturing with reference to operating conditions of vessel reactors such as VVER is investigated.

*Key words:* tungsten bearing small activated vessel steel, a neutron irradiation, radiating resistance, recession of the induced radio-activity.

UDC 548.4:539.219.2

**A link between the mechanisms and paths of fatigue crack growth for polycrystals.** Margolin B. Z., Shvetsova V. A., Balakin S. M. – Problems of Materials Science, 2007, N 2(50), pp. 101–118.

A link is considered between the fatigue crack growth mechanisms and fatigue crack paths on I and II stages. Substantiation of fatigue crack path criteria for I and II stages is given on the basis of analysis of the physical and mechanical aspects of fatigue crack growth in polycrystals. Conditions are considered for microcracks to be initiators for cleavage fracture.

*Key words:* fatigue crack, growth mechanism, fatigue crack path criterion, cleavage initiator.

UDC 669.715:620.196.2

**Research of propensity of deformable aluminium alloys to intercrystalline, stratifying and energized corrosion.** Gorshkova T. A., Baranova A. N. – Problems of Materials Science, 2007, N 2(50), pp. 119–124.

Corrosion stability of aluminium alloys of systems Al–Mg–Mn, Al–Cu–Mg–Mn, Al–Zn–Mg–Cu, Al–Cu–Mg–Si after various modes of ageing is investigated with the purpose of an establishment of an opportunity of manufacturing of details of machines from these alloys working in corrosive-active environments. Has been made the metallographic analysis.

*Key words:* an aluminium alloy, intercrystalline corrosion, stratifying corrosion, corrosion stress.