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ABSTRACTS OF PUBLISHED ARTICLES

UDC 621.791.053:539.389.3

The formation of σ -phase in austenitic-ferritic weld metal, type X17H10M2, in thermal ageing. N i k o l a e v Yu. K. – Problems of Materials Science, 2001, N 1(25), p. 5–9.

An influence of the temperature of ageing and the ferrite content of metal upon the time of the formation of σ -phase has been investigated. Time-temperature diagram of the formation of σ -phase in ageing the weld metal, type X17H10M2, has been plotted.

Key words: weld joints, high-temperature operation, chrome-nickel austenitic-ferritic weld metal, the formation of σ -phase, ageing, time-temperature diagram.

UDC 678.067–419:629.12.011

Joint application of polymeric composites materials in the sandwich-type of high-speed advanced vessels. F r o l o v S. E. – Problems of Materials Science, 2001, N 1(25), p. 10–24.

The sandwich-type polymeric composites, based on the Russian and foreign polymers, fillers and reinforcement materials accepted for application by classification societies have been created. Joint application of heterogeneous materials, being efficient in multi-layer structures of the sandwich-type composites, provides for optimum combination of the mechanical, toxicological and ecological properties. The multi-stage chemical process for molding macroheterogeneous multi-layer sandwich-type composites for the curvilinear shells of hulls and superstructures of high-speed advanced vessels has been developed.

Key words: sandwich-type polymeric composites, combined compositions and structures, mechanical properties, fire-resistance, environmental safety, chemical molding process, shells of vessel hulls.

UDC 678.067:539.319

Research of residual stresses in hybrid polymer composites. P a r s h i n a L. V. – Problems of Materials Science, 2001, N 1(25), p. 24–31.

One of a possible way of determination of residual stresses and strain hybrid polymer composites is presented. The method consists in an estimation of curvature of unbalanced composite by using experimentally measured its deflection from a plane.

The possibility of using of the value curvature for solution of the return task of determination linear coefficient of thermal extension of materials of layers under the known geometrical and mechanical characteristics is represented.

Key words: hybrid composites, residual technological stresses, linear coefficient of thermal extension.

UDC 669.15–194.53:621.039.531:621.791.042

Development of welding consumables for welding of heat-stable low-activated steels. Burochkina I. M., Karzov G. P., Kozlov R. A., Rybin V. V., Sherbinina N. B., – Problems of Materials Science, 2001, N 1(25), p. 32–35.

Low-activated welding wire and electrodes for welding pearlitic class steels, ensuring the operating characteristics of weld joint metal to be on a par with the properties of wide-used native and foreign welding consumables, have been developed.

Key words: low-activated welding wire and electrodes, pearlitic class steel, mechanical properties of weld joints, processability.

UDC 669.715:621.791.755

Specific features of reversed-polarity plasma-arc d-c welding of hull aluminium alloys. Bogdanov G. Ya., Yeryshev O. N., Kozlov H. M., Mihailov V. I., Semenov V. A. – Problems of Materials Science, 2001, N 1(25), p. 35–45.

Main specific features of plasma-arc welding of aluminium alloys, which have to be taken into consideration at creation of specialized equipment and development of optima technological processes, have been reviewed. On the basis of plasmatron prototype model and plasma-arc welding set there have been developed technological processes providing for making high-quality standard butt and non-standard overlap joints in making thin-walled frame-free panels of aluminium alloys. The results of studies of welded joints quality and properties.

Key words: hull aluminium alloys, plasma-arc welding, welded joints, quality, properties.

UDC 621.791.034

On an opportunity of adaptation of the ideal liquid clean-flow theory to the welding torches shielding gas real flows. Averianov A. A., Sharapov V. G. – Problems of Materials Science, 2001, N 1(25), p. 45–50.

An opportunity of adaptation of the liquid clean flow theory to a description of the motion of gas inside the torches is shown.

Calculation procedure for the shape of a welding tip, aimed at an increase in efficiency of weld shielding, is presented; the results of its realization at the welding torches for Type ПДИ semiautomatic welders are given.

Key words: welding, gas, shielding efficiency, method of calculation, the shape of a welding tip.

UDC 669.14.018.293:539.37

Basing a procedure for determination of steel resistance to laminated fracture. B a s h a e v V. K., D a n i l o v G. I., L e o n o v V. P., M a l y s h e v - s k y V. A., M i t r o h i n a N. A., F e d o r o v a T. A. – Problems of Materials Science, 2001, N 1(25), p. 51–62.

There have been reviewed the requirements of classification societies of various countries to the criterion for ship's hull plates resistance to Ψ_z laminated fracture which is reduction area of destructively tested tensile cylindrical specimen, cut out in such a way in Z-direction that its longitudinal axis is perpendicular to the plate plane.

An influence of the specimen sizes, low climatic temperatures and extreme loads on parameter Ψ_z of the ship's hull plates, meant for construction of the offshore icing-proof rigs and other facilities for mastering the northern shell of Russia, has been studied. For the first time in the world there has been discovered the Ψ_z parameter reduction effect at low climatic temperatures.

Developed in harmonization with the MAKO requirements has been procedure for determination of parameter Ψ_z , which is approved by RF Register of Shipping.

Key words: laminated fracture, parameter Ψ_z , classification society, offshore icing-proof rig.

UDC 669.017:539.219.2

Development of models of short and long cracks growth in metallic materials under cyclic loading. D e m i d o v A. G., R o z a n o v M. A., F i s h g o y t A. V., C h e r k a s o v a S. A. – Problems of Materials Science, 2001, N 1(25), p. 63–76.

General scheme of growth of short and long cracks in metallic materials under cyclic loading has been developed. A quantitative model of crack growth by a cleavage (quasi-cleavage) structure-dependent mechanism, making it possible to calculate the short and long cracks growth rate at the first stage of their propagation, has been offered.

On the basis of a hypothesis of accumulation of the plastic strain critical value in a material before the fatigue crack tip there has been offered a formula describing the structure-independent crack growth kinetics when this crack propagates under every cycle of loading.

A hypothesis explaining the relation between crack growth rate and fatigue groove spacing has been proposed.

Key words: metallic materials, cyclic loading, short and long cracks, fatigue grooves, quantitative model of crack growth, a cleavage (quasi-cleavage) structure-dependent mechanism.

UDC 620.197.5:661.666.2

New anodic materials for cathodic-type anticorrosive system based on graphitic carbon. K u z m i n Yu. L., T r o s h c h e n k o V. N. – Problems of Materials Science, 2001, N 1(25), p. 77–82.

An opportunity of application of graphitic carbon materials with the object of making anodes for the cathodic-type anticorrosive system for protection of the metal products in sea water has been considered. On the basis of a study of the electrochemical and physicomechanical properties there have been defined the requirements to graphitic carbon materials and their unit anode consumption rate.

Key words: metal products, sea water, cathodic-type anticorrosive system, graphitic carbon materials.

UDC 621.793:669.38:629.12.011

Antifouling electrode-active gas-thermal coatings based on copper, with controlled efficiency, for ships with steel hulls. K a b a n o v Ye. B.
– Problems of materials science, 2001, N 1(25), p. 82–87.

Antifouling electrode-active copper-base coatings with a sublayer of metallic oxides or chrome-nickel alloy, applied to the ship's steel structural members by the flame-gas and electric-arc methods, have been developed.

Biocide-copper ion coating ionization amounting to not less than 5 mkg/cm² p.d. is shown to provide for antifouling protection. At the same time, varying the thickness of a coating makes it possible to ensure the required protection lifetime and self-regulation of the copper-ionization process depending on salinity, the temperature and flow velocity of water. Proceeding from ionization rate it is possible to calculate the required thickness of an antifouling coating.

Key words: antifouling electrode-active gas-thermal coatings based on copper, ship's hulls of carbon steel, a sublayer of metallic oxides, ionization rate, the thickness of a layer.