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CONTENTS

ABSTRACTS OF PUBLISHED ARTICLES

UDC 669.14.018.41

Influence of structure on the cold resistance of low-alloy steel. Motovilina G. D., Orlov V. V., Khlusova E. I. – Problems of Materials Science, 2005, N 3(43), pp. 5–12.

The analysis of influence of structure on cold resistance of steels of the increased strength (yield point not less than 390 MPa) is carried out with different alloying. On the basis of analysis of the structure, formed during cooling of laboratory samples with different speeds from temperature of austenitizing with subsequent tempering, and also the structure of industrial plates it is shown that the formation of dispersed ferrite- carbide structure with increased dislocation density contributes to an increase in the cold resistance of steel with the mixed structure. With formation of ferrite-pearlite structure it is necessary to ensure the effective refining of ferrite grain with the content of pearlite not over 10%.

Key words: the low-alloy steel of the increased strength, cold resistance, structure, the regimes of cooling, grain size, method of the study.

UDC 669.15—194.2:621.771.23:621.78

Influence of the regimes of thermo-mechanical treatment on the structure and the mechanical properties of sheet rolling made of the low-carbon low-alloy steels. Schastlivtsev V. M., Tabatchikova T. I., Yakovleva I. L., Umova V. M., Vinogradova N. I., Yegorova L. Yu., Semicheva T. G., Kruglova A. A., Khlusova E. I., Vysotskiy V. M. – Problems of Materials Science, 2005, N 3(43), pp. 13–23.

Mechanical properties of sheet rolling with thickness of 50 mm made of the low-carbon low-alloy steels, subjected to thermo-mechanical treatment are investigated under different conditions. The structure of steels is investigated using methods of metallography and electron microscopy. The structure factors are indicated which influence mechanical properties. The prospects for usage of this rolling stock for manufacturing of the large-dimension welded constructions are shown.

Key words: low-carbon low-alloy steels, sheet rolling, structure, mechanical properties, thermo-mechanical working, the field of application.

UDC 669.15—194.52:621.778

Evolution of dislocatory substructures in carbon steels with the wire drawing with the subsequent sagging.
Leboshkin B. M., Gromov A. V., Tsellermayer V. Ya., Kozlov E. V. – Problems of Materials Science, 2005, N 3(43), pp. 24–31.

The special features of the evolution of dislocatory substructure of widely used ferrite-pearlite steels of the brands Ст1кп, Ст2кп and Ст3кп are investigated during the wire drawing and the subsequent technological operation of sagging.

Key words: low-carbon ferrite-pearlite steels, the evolution of dislocatory substructure, wire drawing, the operation of sagging.

UDC 669.295.69:621.793

Electric detonation carbonizing and boronizing of iron: the relief of surface, phase composition and the defective substructure of the modified layer. Bagautdinov A. Ya., Budovskikh E. A., Ivanov Yu. F., Martusevich E. V., Gromov V. E. – Problems of Materials Science, 2005, N 3(43), pp. 32–39.

The studies of the relief of surface, phase composition and defective substructure of the modified layer of iron, subjected to electric detonation with simultaneous alloying with carbon and with boron are carried out using methods of scanning and translucent diffraction electron microscopy . Formation of thin layer on the surface of the irradiation is discovered, which consists of the condensed particles of boron and carbon-graphite fibers. The gradient structure of fusion zone and alloying is revealed. It is shown that the reasons for formation of gradient structure are the change in the concentration of the alloying elements in the depth, and also the gradient of the temperature field.

Key words: the modified layer of iron, electric detonation alloying (carbon, boron), the method of scanning electron microscopy, the relief of surface, phase composition, the defective substructure.

UDC 669.715`781.029.46:539.4

Mechanical properties of boron-aluminum with the compound structure of reinforcement. Ivanov V. G., Kuchkin V. V., Gorynin V. I. – Problems of Materials Science, 2005, N 3(43), pp. 40–44.

The influence of the packing structure of longitudinal and transverse fibers on the strength of boron-aluminum during tension and compression actions is investigated. It is established that the strength during compression of flexible rods depending on the arrangement of layers can be distinguished in 2,5 times.

Key words: boron-aluminum, fibers, longitudinal-transverse reinforcement, strength during compression, tensile strength.

UDC 669.715`781:621.77:621.78

Influence of heat treatment in vacuum on the mechanical properties of boron-aluminum, obtained with application of gas-static extrusion of the plasma-sprayed semifinished products. Gorynin V. I., Ivanov V. G., Kuchkin V. V. – Problems of Materials Science, 2005, N 3(43), pp. 45—51.

The influence of vacuum annealing on the mechanical properties of boron-aluminum with the plasma-sprayed matrix from the alloy of system Al-Zn-Mg is investigated. It is established that the strength of the composite in the direction of reinforcement and in the transverse direction substantially rises with introduction into the composite manufacturing process of the additional operation of vacuum annealing of the sprayed billet before gas-static extrusion.

Key words: composite aluminum-boron material, plasma spraying of matrix, vacuum annealing, mechanical properties.

UDC 678.5.029.46

The thermal expansion of the composites on the basis of polyarylate, filled with short fibers. Kozlov G. V., Burya A. I., Dolbin I. V. – Problems of Materials Science, 2005, N 3(43), pp. 51–54.

Thermal expansion of polymeric composites filled with short fibers is investigated. It is shown that thermal-expansion coefficient of such composites is influenced, as a minimum, with two factors: the degree of orientation of fibers and the level of interphase adhesion on the boundary: polymer-filler. Use of organic fibers for reduction in the thermal-expansion coefficient gives much stronger effect in comparison with the fiberglass because of formation of chemical bonds on the phase boundary.

Key words: polymeric composite, filler, thermal expansion, orientation of fibers, interphase adhesion.

UDC 677.021.154

Physico-mechanical properties of the composite with woven basaltic basis. Imankulova A. S. – Problems of Materials Science, 2005, N 3(43), pp. 55–60.

Textile composite material with reinforcing woven basis made of basaltic fibers is developed, and its deformation properties are investigated. The possible areas of its application are established.

Key words: composite material, reinforcing woven basis, basaltic fiber, deformation properties, fields of application.

UDC 669.715:621.791.052

Study of the weldability of the aluminum alloys АД31 + АД31, АД31 + АМг5 and the mechanical properties of welded joints. Pavlova V. I., Zarubin V. M., Osokin E. P. – Problems of Materials Science, 2005, N 3(43), pp. 61–70.

The following is investigated for the aluminum alloys АД31 + АД31, АД31 + АМг5: weldability, their sensitivity to thermal welding cycle and the mechanical properties of the welded joints.

It is shown that the weldability of these alloys is satisfactory, and tendency toward formation of hot cracks during manual argon-arc welding with added material of the brand СвАМг61 it is not noted.

The strength of all tested samples practically does not depend on the type of connections and duration of aging after welding and comprises 145–154 MPa, i. e. 0,66–0,70 of the actual strength of the alloy of the brand АД31. The destruction of samples occurs through the heat-affected zone of the alloy of the brand АД31 at a distance of 10–12 mm from the boundary of the fusion.

Ultimate stress and the yield stress of metal of the near weld zone of the alloy of the brand АД31 comprise respectively 152,2–159,4 and 98–100 MPa, i. e. 0,70–0,72 и 0,54–0,56 of the actual values of these characteristics of the alloy of the brand АД31.

Key words: argon arc welding, aluminum alloys, welded joints, loosing of strength, mechanical properties.