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ABSTRACTS OF PUBLISHED ARTICLES

UDC 669.14.018.293:621.78.014

Influence of accelerated tempering to structure and characteristics of ship-building steel D40S. Semicheva T. G., Khlusova E. I., Sherokhina L. G., Zykov V. V. – Problems of Material Science, 2004, N 4(40), p. 5–11.

Influence of accelerated high temperature tempering to mechanical characteristics and structure of shipbuilding steel D40S is investigated designed instead of standard long-standing tempering mode. It is stated that accelerated tempering performed under temperature lower than A_{c1} , ensures stability of mechanical characteristics and specified level of cold-resistance for steel D40S.

Tempering performed in intercritical temperature range substantially reduces yield strength and impact toughness of steel because of formation of large grains.

Key words: shipbuilding steel, accelerated tempering, structure and characteristics.

UDC 669.15–194.56:539.382:620.179.18

Investigation of plastic deformation of austenite steel using X-ray diffractometry and acoustic emission methods. Korchevsky V. V. – Problems of Material Science, 2005, N 1(41), p. 12–21.

Processes of plastic deformation of cold-rolled thick plate steel 12X18H10T under single axis extension using different methods: acoustic emission, X-ray diffractometry, optical microscopy, hardness measurement.

Key words: austenite steel, cold-rolled thick plate steel, plastic deformation, research methods.

UDC 669.71`72:539.2

Modification of structure of high strength alloys of aluminum and magnesium with small amount of scandium. Nogay M. N., Andreyev G. N., Barakhtina N. N. – Problems of Material Science, 2005, N 1(41), p. 22–29.

Complex Al–Mg–Sc system for modification of alloys with small amount of scandium was investigated regarding structure of cast metal. Ti, B and Hf were selected as additional modifiers. Macro- and microstructure of alloys were investigated. Possibility of fine-grain structure formation in ingots of these alloys is shown.

Key words: Al–Mg alloys, alloying with small amount of scandium, complex modification of structure, fine-grain structure, intermetallic structure, dispersoid.

UDC 621.791.042.3

Metal chemical composition influence of the weld made by mechanized welding using powder wire to its structure and mechanical properties. Bishokov R. V., Melnikov P. V., Gezha V. V. – Problems of Material Science, 2005, N 1(41), p. 30–37.

Alloying influence for formation of the weld metal structure and mechanical properties of welds during welding using powder wire was investigated so as to find optimum composition of welding wire ensuring a specified strength level and high toughness of welds under negative temperatures.

Alloying by manganese, silicon and nickel was performed using filler of powder wire with additions of FeMn, FeSi and nickel powder. So as to increase impact toughness of welds microalloying was performed with titanium, aluminum and boron using FeTi, FeB and aluminum powder. Titanium and aluminum available in FeTi performed functions of deoxidizing agents and modifiers of weld metal. Optimum content of alloying elements in weld metal was established for welding using powder wires made of steel having yield strength of 400 and 500 MPa. It resulted in development of small diameter powder wire brands 48ПП-8H and 48ПП-11H.

Key words: small diameter powder wire, alloying, bainite, cold resistance.

UDC 669.15–194:621.039.536.2:539.563

Prediction of brittle failure of reactor body steels under complex thermomechanical loading using local stochastic approach. Margolin B. Z., Kostylev V. I., Keim E. – Problems of Material Science, 2005, N 1(41), p. 38–54.

New local criterion for brittle failure with stochastic approach used earlier by authors for forecasting of $K_{Ic}(T)$, was modified for case of non-isothermic and non-monotone loading. The approach is proposed permitting to calculate probability of brittle failure of cracked elements under complex thermomechanical loading specific for emergency cooling of reactor body. The approach proposed is verified by means of comparison of calculated and experimental data regarding influence of different modes of preliminary thermomechanical loading to failure toughness of reactor body steels.

Key words: reactor body steels, thermomechanical loading, probability of brittle failure.

UDC 669.15–194.2:539.219.2

Regarding scale effect during tests for cracking resistance using modified Griffith approach. Ilyin A. V., Mizetsky A. V., Filin V. Yu. – Problems of Material Science, 2005, N 1(41), p. 55–69.

Concepts of elastic energy released and failure energy capacity regarding crack moving in elastic plastic material are discussed. Numerical experiments using finite elements method and definition results for critical values of J -integral for specimens made of low-alloyed steel having different thickness and configuration well agree with conclusion drawn from proposed model of unstable brittle failure. Practically important result is justification of calculation scheme for scale effect and transition from data obtained during tests of standard specimens under conditions of full-scale flow used for forecasting of failure of structural elements having cracks.

Key words: low-alloyed steel, brittle failure, J -integral, scale effect, full-scale flow.

UDC 669.14.018.41:539.536

Regarding problem of cold-resistance of steels having natural thickness under temperature of elastic-brittle transition $T_{к6}$.

Danilov G. I., Ilyin A. V., Leonov V. P., Fedorova T. A. – Problems of Material Science, 2005, N 1(41), p. 69–79.

Relationship of $T_{к6}$ temperature of elastic-brittle transition from elastic energy accumulated for a moment of crack starting. Amount of elastic energy is influenced by geometric dimensions of specimens having natural thickness and spacing between supports for three-point bending. Optimum relationships are defined for dimensions of specimens for which $T_{к6}$ value is only a parameter of cold-resistance of body steel.

These results are applied for development of procedures (approved by Russian Maritime Registry) for definition of cold-resistance of steels used in marine structures regarding $T_{к6}$ temperature and T_{xp} temperature of brittle crack inhibition.

Key words: sea platform, cold-resistant steel, brittle failure, $T_{к6}$ temperature of elastic-brittle transition, optimum dimensions of specimens having natural thickness, three-point bending.

UDC 669.018:539.431.2

Regarding possibility for estimation of medium influence for parameters of cracking resistance of materials using data of testing of smooth specimens for slow stretching. Malyshev V. N. – Problems of Material Science, 2005, N 1(41), p. 79–83.

Simple relationships are proposed for parameters of cracking resistance of metallic materials on air and in corroding medium and standard characteristics of plasticity defined during testing of smooth specimens for slow stretching.

Key words: metallic materials, parameters of cracking resistance, slow stretching tests medium influence, evaluation method.