ANALYTICAL STUDY OF MECHANICAL PROPERTIES OF ROD-LIKE CENTRALIZERS FOR CASING TUBES

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Purpose. The paper aims at studying the influence of the axial mobility of the centralizer's ends on the parameters of its rigidity and strength. These characteristics are necessary to assess the passability of the casing string and quality of well completions.

Methodology. Classical linear theory of shallow rods was used to model operating link of the centralizer. Physically the rod was taken for inextensible along the axis and elastic for bending.

Findings. The problem of the interaction of elastic rod casing centralizers with the wellbore wall is considered. The stress-strained state of the arcuate rod with six various fastening options in the conditions of point contact was studied. Analytical dependences between the contact force and the mutual convergence of the casing string and the borehole wall, as well as formula for the equivalent stress were determined. A way of fastening the rod along the axis of the pipe significantly affects these characteristics, in particular, presence or absence of reciprocal displacements of the ends of the rod in the axial direction. The engineering formulae of two-side estimations of rigidity and strength of real centralizers' designs were obtained.

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Keywords: casing centralizer, rod, contact interaction, stressed state, rigidity, strength

INFLUENCE OF OVERHEATING AND COOLING RATE ON THE STRUCTURE AND PHYSICOCHEMICAL PROPERTIES OF AL-CU ALLOYS

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Purpose. Study the was to investigate the structural properties of Al-Cu alloys depending on the heating temperature of the alloy above the liquidus, the cooling rate [1-3].

Methodology. The investigations were carried out on Al-Cu alloy samples with copper content 25,0 -36,0% (mass.), the rest is aluminum. The melting of samples was carried out in a Taman furnace at temperatures of 820-1100 K with a graphite heater in alund crucibles. Cooling rate of alloys was 10 K/s. Part of the samples were made using the same method, but after heating poured into wedge shapes, at the expense of which when cooled in the wide part of the wedge the cooling rate was obtained 102 K/s, and in the thin part 104 K/s. In the work we use differential thermal, metallographic, chemical and X-ray spectroscopic analyses.

Findings. The effect of overheating of the melt and cooling rate of alloys of the Al-Cu system with a copper content of 25.0-36.0% (mass.), the rest of the aluminum is investigated. It is shown that an overheating of the liquid at 50-100 K above the liquid-liquid line leads to the formation of a fine-dispersed eutectic structure and the inhibition of the formation of primary aluminum crystals in the pre-evacuation of alloys and the Al2Cu phase in hypereuvtectic alloys, in accordance.

An increase in the melt overheating temperature by 150 K above the liquid-liquid line and the subsequent cooling at 103-104 K/s leads to the complete inhibition of the formation of primary crystals.

An overheating of the melt on 100-150 K alloys above the liquid line and subsequent cooling with a velocity of 103-104 K /s reduces the rate of corrosion by 30-45% and increases the numerical value in 1,3-1,45 times the relative wear resistance, and the brittleness of alloys decreases in 1,2-1,35 times in comparison with the samples after casting.

Keywords: melt, overheating of the alloy above the liquidus line, Al-Cu alloy, Al2Cu phase, eutectic

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ELASTIC-DISSIPATIVE STABILIZATION OF DYNAMIC PROCESSES OF HYDROPULSE SYSTEMS OF MINING MACHINES

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Purpose. Investigation of elastic-dissipative stabilization of dynamic processes of hydropulse systems of mining machines.