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Thematic direction: Effect of nanosecond unipolar electropulse effects on the properties of the alloy Cu-1% Cr. Part 2.

Relation of alloy properties with Cr content in Cu lattice

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Abstract

The effect of treatment of copper melt with chromium additives in the amount of 1% by weight is considered nanosecond unipolar electric pulses with a frequency of 1000 Hz, a single signal duration of one nanosecond and a power of 10 kW on the electrical resistivity and hardness of the resulting alloy. A study was made of the macro and microstructure of alloy samples created using electropulse effects and comparison samples obtained under the same thermal conditions, but without it. The samples were aged for 2 hours at 4500C. It has been found that electropulse treatment of the melt leads to an increase in hardness and decrease in the electrical resistance of the alloy as well as during aging, and the influence of this effect remains noticeable even after the aging process. Hardness and electrical resistance in all alloy samples are described mathematically as a function of chromium content in the copper lattice and in secondary precipitates. The role of nanosecond unipolar electroimpulsive effects on the Cu-1% Cr melt in improving the above characteristics of the resulting alloy compared with the thermo-time treatment without the electropulse effect is revealed. An explanation of the mechanism of the electropulse effect on the melt, leading to the separation of chromium atoms in the liquid state and the subsequent decrease in its solubility in the copper lattice, is proposed. The results of the study are presented in the form of drawings of macro- and microstructure of samples of the alloy Cu-1% Cr, tables, graphs and mathematical formulas. It was concluded that it is advisable to use a nanosecond unipolar electropulse effect with a frequency of 1000 Hz, a single signal duration of one nanosecond and a power of 10 kW per Cu-1% Cr melt to produce the corresponding alloy with improved hardness and electrical resistance.

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