

**RESEARCH OF INFLUENCE OF THE TYPE AND PROCESSING MODES ON  
PROPERTIES OF THE DEFORMED SEMI-FINISHED PRODUCTS OF  
ELECTROTECHNICAL APPOINTMENT FROM AL-ZR SYSTEM ALLOYS**

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Aluminum and a number of its alloys are widely applied in electrical equipment due to their high conductivity, corrosion resistance, small specific weight, good workability pressure, thus some alloys show the high durability, heat conductivity, resistance of creep and other special properties.

In manufacturing of semi-finished products and electrotechnical appointment products special attention has recently been paid to alloys with zirconium additives. Zirconium allows increasing temperature of aluminum recrystallization considerably that in turn provides operability of wires for air-lines electricity transmission at a temperature up to 250 °C. Producing electrotechnical rolled wire by classical methods leads to considerable losses of conductivity at the expense of increase in density of dislocations in the deformed metal owing to a large number of transitions and high total extent of deformation.

The conducted researches were directed on studying the influence of the deformed semi-finished products technology with application of various methods of processing by pressure, upon mechanical and electrophysical properties of samples from Al-Zr system alloys. Zirconium has been selected as the main alloying element that was incorporated with an amount of 0.15 wt. %.

Researches needed the following technological schemes of receiving hot high-quality rollings (HHQR); combined rolling pressing (CRP); combined molding and rolling pressing (CMRP) from bars with a diameter of 9 mm as cast products.

The CMRP (the combined molding and rolling pressing) technology has been applied for the research. The CMRP technology was realized on experimental installation, the liquid metal was poured into the rolls, where he successively crystallized in the caliber of rotating rollers, was pressed out by them and squeezed out through a matrix in the form of a hot-pressed bar with a diameter of 9 mm.

The deformed bar was subjected to drawing. The rolled wire drawing was carried out on a chain camp without intermediate annealing and cold deformed wire with a diameter of 2 mm was received.

The analysis of mechanical properties of hot-rolled bar and wire allowed finding out that at cold drawing of the rolled wire made by the HHQR and CRP methods, there is a hardening for 50% (Fig.1)

At the first stage of work we carried out the comparative analysis of ingots preparation modes and the HHQR and CRP technologies which allowed revealing the following regularities. The way of rolled wire production has considerable impact on its strength properties. The technology of CRP allows to receive higher strength properties (116-126 MPa), in comparison with the HHQR technology (101-106 MPa), fig. 1 a

After cold drawing the wire made from rolled wire produced by CRP, has higher strength properties inherited (220-231 MPa) unlike HHQR (181-191 MPa), (fig. 1b).

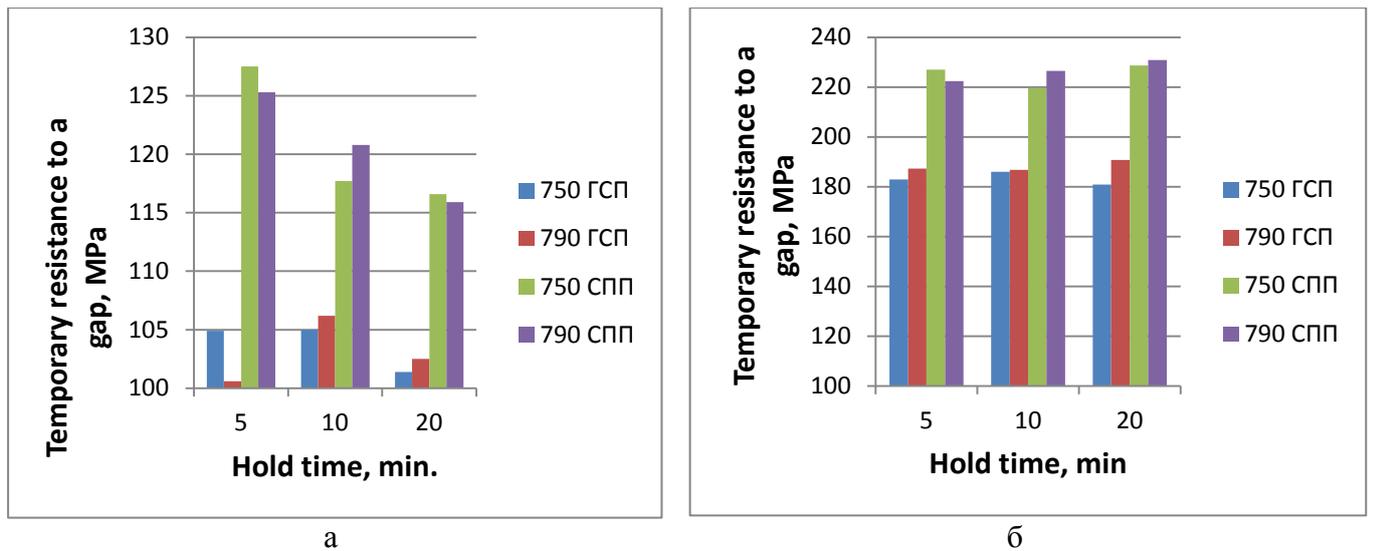


Figure 1- Distribution of strength properties depending on modes of preparation of an alloy and rolled wire manufacturing techniques: а- rolled wire, б- wire

It is established that essential value at a size of specific resistance of a wire render fusion hold time after introduction of a ligature and filling temperature. At the fusion filling temperature of 750 °C the minimum value of wire resistance is recorded. The increase in hold time of fusion before filling, leads to fuller assimilation of a ligature, thus values of resistance decrease (fig. 2).

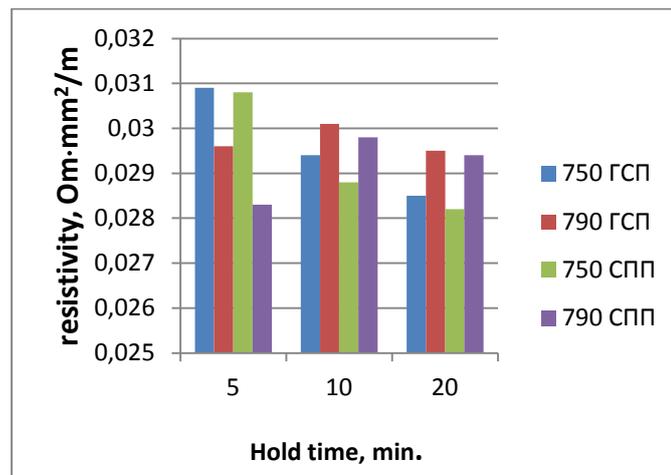


Рисунок 2- Dependence of specific resistance of a wire on hold time and manufacturing techniques of initial preparation

At the second stage the analysis of two high-performance and energy saving methods of the combined processing was carried out. As the combined perspective techniques of rolled wire manufacturing which is the initial stock for wire production, CRP and CMRP technologies were chosen.

The conducted researches allowed finding out that the increased strength properties characterize the wire obtained from the rolled wire, made with combined processing methods. The stock production by the CRP method gives the chance to receive the highest values of conductivity and temporary resistance to the rupture in the wire. However application of the CMRP method in wire production allows considerable lowering of labour and power consumption and getting the wire with a good combination of strength and electrophysical characteristics