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EFFECT OF QUENCHING FROM THE MELT ON PHYSICO-CHEMICAL PROPERTIES OF THE Pb–Sn–Ca BATTERY ALLOY

The objects of study are mechanical and corrosion properties of industrial and experimental strips for the positive grid of lead-acid battery of the $PbCa_{0.05}Sn_{1.1}$ alloy, including doping of barium.

The purpose of the work is optimization of the structure and properties of the lead alloy strips of $PbCa_{0.05}Sn_{1.1}$ by the use of a perspective alloy crystallization process of quenching from the liquid state, as well as micro-alloying with barium.

The method of research is a comparative analysis of experimental data.

A promising method for producing the $PbCa_{0.05}Sn_{1.1}$ alloy strips for lead-acid battery grids based on quenching from the liquid state (QLS) is proposed. This paper contains comparison of experimental results for physico-chemical properties of the $PbCa_{0.05}Sn_{1.1}$ alloy strips that were obtained according to the industrial technology of rolling with high (93%) degree of deformation and experimental method of QLS. Experimental results demonstrated higher structure dispersibility and microhardness of QLS-strips, also positive effect of barium microalloying 0.015 wt% was detected, that further increased microhardness of QLS-strips by 1.35 times per day and by 1.6 times as a result of 48 hours aging. Besides, higher corrosion resistance of QLS-strips was found.

The investigation results of mechanical and corrosion properties of industrial and experimental strips are largely explained by diffraction studies of the fine structure.

Keywords: battery alloy of the Pb–Ca–Sn system, doping of Ba, quenching from the liquid state, structure, mechanical properties, corrosion resistance

Fig. 1. Structures of the investigated Pb–Sn–Ca alloys: *а* – QLS strip, *б* – QLS strip + Ba, *в* – industrial strip

Fig. 2. Diffraction patterns of industrial (*а*) and QLS strip (*б*)

Fig. 3. Evolution of microhardness of the $PbCa_{0.05}Sn_{1.1}$ alloys during artificial aging at 80°C: ● – industrial strip, ■ – QLS strip, ◆ – QLS strip + Ba

Fig. 4. Mass loss of the alloys during corrosion: ● – industrial strip, ■ – QLS strip, ◆ – QLS strip + Ba