IMPROVING THE TECHNOLOGICAL SCHEME OF BRIGHT NICKEL PLATING OF ALUMINIUM ALLOY 1560

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Before applying galvanic coatings to 1560 aluminum alloy, various technological schemes for surface preparation can be used. Before applying bright protective and decorative coatings, it is necessary to ensure a high surface roughness class. The choice of a degreasing solution depends on the type of grease contamination present and does not have any effect on the subsequent processing technology. The choice of the following process steps can have a significant impact on the adhesion strength of the electroplating to the substrate. The pickling operation cannot be used for polished aluminum alloys, as the surface may lose its luster as a result of this operation. It is possible to improve the surface roughness by chemical or electrochemical polishing, but this will complicate the process too much. Chemical activation is a required operation and can be performed in a solution of H_2SO_4 (20 – 30 g L^{-1}).

Difficulties in the deposition of galvanic coatings on aluminum alloys are associated, on the one hand, with the electronegative potential of aluminum, and, on the other hand, with rapid passivation and the formation of an oxide film on the surface. According to the literature [1], methods to overcome these difficulties are known as special aluminum surface preparation.

Zincate treatment of aluminum cannot be used to prepare polished aluminum because satisfactory adhesion of the coating to the substrate can be achieved only on a matte surface.

Direct deposition of nickel coatings on 1560 aluminum alloy from a special electrolyte has been shown to achieve quite satisfactory results. The electrolyte has the following components: $NiSO_4 \cdot 7H_2O$ (200 g L^{-1}), H_3BO_3 (25 g L^{-1}), NaF (2 g L^{-1}), $K_2S_2O_8$ (2 g L^{-1}). Processing conditions: pH = 4.5 – 5.4; t = 50 °C, J_k = 1.5 A dm^{-2}. After nickel plating, heat treatment was performed at t = 200 °C for 1.5 hours. However, after prolonged use of this electrolyte, more than 10 % of defects were detected, which is an unacceptably high rate.

The anodic oxidation of 1560 alloy in H_3PO_4 (200 g L^{-1}) at T = 20 °C at a voltage of U = 50 V for 10 min provided high-quality adhesion of the coating to the substrate and allowed to maintain a bright surface finish. When using anodic oxidation in phosphoric acid, the preliminary activation step in sulfuric acid can be excluded from the technological scheme of surface preparation.

The need to maintain a high surface shine requires the use of bright nickel plating at the last stage of the operation. The subsequent heat treatment lasting 1.5-2 hours at t = 200 °C helps to reduce internal stresses in nickel coatings and to detect poor adhesion of the nickel coating to the substrate.

References:

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