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Surface hardening of the aluminum alloys AL3 by electrolytic-plasma treatment(Article)(Открытый доступ)

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The article presents the research results of the effect of electrolytic-plasma processing on the structural-phase transformation of aluminum alloy samples. The discharge was ignited from the DC source. When the voltage is switched on, ionization and boiling of the electrolyte occurs. When bubble boiling occurs around the active electrode, large current pulsations are observed. Due to the formation of a gas-vapor jacket and the passage of electric current through it, a low-temperature plasma is formed, which has the characteristic blue color of the glow of the shell around the part. Electric micro-arc plasma is excited on the surface of the product, in which an intense heating of the workpiece occurs from heat generation. After microarc oxidation, the microstructure of quenching and artificial aging in the electrolyte flow is observed on the sample surface. As a result of quenching in the electrolyte stream, solid copper solution in aluminum and pinpoint fine inclusions dissolve from the microplasma temperature, the phases oxidize to form aluminum corundum. X-ray analysis of the samples after electrolytic-plasma processing revealed an increase in the intensity and broadening of the diffraction lines relative to the initial state, which indicates the residual surface stress, which during operation provides an increase in the wear resistance of the part. The average microhardness, after electrolytic-plasma treatment, is 746 MPa, which is about 2.5 times higher than that of the starting material. 