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Estimating Qualitative Parameters of Aluminized Coating Obtained by Electric Spark Alloying Method

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Abstract

There are considered the features of the structural and phase state of the aluminized coatings obtained by the method of electric spark alloying (ESA) on the specimens made of 20 steel and 4 steel grades. It has been found out that with increasing discharge energy, there is increased the thickness and microhardness of the white and diffusion layers, as well as the surface roughness, and also there are changed the chemical and phase compositions. At low discharge energies, there is formed a layer predominantly consisting of α-Fe and aluminum oxides. It has been stated that increasing discharge energy results in obtaining the layer consisting of iron and aluminum intermetallics and free aluminum as well. In comparison with 20 steel, at electric spark alloying of 40 steel, there is increased the depth of the zone of increased hardness and microhardness thereof. In order to reduce the roughness and increase the continuity of the coatings obtained, it is recommended to conduct the electric spark alloying process applying the same electrode (aluminum), but at low discharge energies (Wp = 0.52 J). The comparative studies of the heat resistance of the aluminized coatings, which had been obtained with the use of the classic technology, that is, in aluminum melt, and by the ESA method with the use of an aluminum electrode, showed that electric spark coatings were characterized by a higher heat resistance. The results of the study make it possible to recommend the ESA technology with the use of an aluminum electrode in order to increase steel resistance to oxidation at elevated temperatures.

Keywords

Electric spark alloying Aluminizing Microstructure Coating Surface X-ray diffraction analysis
X-ray spectral analysis Microhardness Roughness Heat resistance

Notes

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