PHYSICAL PROPERTIES OF THE NIAL INTERMETALLIC COATING PRODUCED BY IRRADIATION WITH A LOW-ENERGY HIGH-CURRENT ELECTRON BEAM

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The widespread use of low-carbon steel in industry in the manufacture of various structures, machine parts and structures is due to the simplicity of processing and the relatively low cost of the material [1]. However, their wear, corrosion and oxidation resistance are weak [2]. One way to improve these properties is to coat in this material. Recently, much attention has been paid to composite coatings of high-temperature intermetallic compounds [1, 2].

A special place among these coatings is occupied by the NiAl intermetallic compound, which combines the properties of both ceramics and metal, having a high melting point, thermal conductivity, oxidation resistance, and high temperature corrosion resistance along with low mass density [3]. All this makes NiAl intermetallic very attractive for coating parts used at high temperatures in aggressive environments, for example, turbine blades of aircraft engines, guide vanes of industrial steam turbines, etc. [4].

Earlier, sources of low-energy high-current electron beam (LEHCEB) and devices for ion-plasma deposition of coatings were separate installations, and during the transfer of processed products from one working chamber to another, they came into contact with the surrounding atmosphere, which is undesirable, and in many cases simply unacceptable. To eliminate this drawback, a combined RITM-SP combined installation, including a source of LEHCEB and a magnetron atomizer, which are mounted on a common vacuum chamber [5].

The aim of this work is to study the physical properties of the synthesis of a surface alloy of Ni-Al using magnetron sputtering of a composite coating on a steel substrate and irradiation with a LEHCEB. The results of a decrease in wear resistance and roughness, as well as an increase in hardness of the formed Ni-Al surface alloy in comparison with an untreated steel substrate, are presented.

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