PERSPECTIVE PROCESSES OF SUPERSONIC HETEROPHASE TRANSFER TO WEAR- AND CORROSION-RESISTANT COATING PRODUCTION FOR MACHINE-BUILDING INDUSTRY COMPETITIVE PRODUCTS

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The present work is devoted to the way of obtaining the advanced corrosion and wear-resistant and porousless coatings via high velocity heterophase transfer methods. The main criteria parameters of spraying methods are the speed the temperature of the particles in heterophase flow. Two spraying methods are chosen for this criteria: cold gas-dynamic (CGDS) and microplasma (MPS) spraying. These methods allow obtaining significant increase of the transfer velocity or enthalpy during simultaneous reduction of dispersed particles temperature. CGDS is one of such methods, based on the durable metallic layer formation effect due to the impact of a supersonic (up to 2-3 Mach number) particles and gas flow on the on the normally arranged surface. In this case the particles temperature being transferred is considerably lower than their melting point. As a result of impacting the substrate surface the particles get attached into clusters, which a continuous coating start to form around. Most probably, this phenomenon is caused by the increased activity of activated boundary sections.

Because of these advantages the CGDS method finds ever-growing application in various fields of engineering processes application.

Microplasma spraying is the refer to the methods of atmospheric plasma spraying. The main advantage of MPS is the low volume of plasma-forming component that allows to reduce the residence time of particles in plasma torch by a factor of ten thus, at first, protecting initial particles structure. At second, according to low power of plasmatron (up to 2-3 KW) and low spot of the plasma torch there is no degradation of the substrate.

Speed and temperature process parameters of these methods of spraying were investigated on the powder alloys such as Al-Zn-Sn, Fe-Cr-Al, Cr etc. The dispersion of the powders was ranged from 20 to 80 microns. The speed and temperature was varied from 300 to 700 m/s and from 80 to 800 centigrade respectively. It was shown that porousless, corrosion and wear-resistant coatings with high adhesion can be produced by using mixtures of these powders and corundum powder with dispersive from 0.1 to 10 microns. The mixtures were produced by mechanical activation and alloying in the disintegrator system at the frequencies up to 400 Hz. The volume fraction of the corundum powder in the mixtures was ranged from 0 to 20%.

It allowed us to obtain coatings with adhesion up to 90 MPa, porosity less than 0.1%, corrosion speed down to 0,081 mm per year and wear coefficient on steel with 5 kg load less than 10^-9 g/km. The results obtained are promising for protection and restoration of the gas turbine blades, tubes, elements of rolling stock, razers etc.