

SEAE P14 TRIBOLOGICAL CHARACTERISTICS OF MULTICOMPONENT COATINGS SYNTHESIZED ON STEEL 45 IN THE PROCESS OF ELECTROSPARK ALLOYING WITH A MIXTURE OF POWDERS

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One of the promising methods of surface hardening of metals is electrospark alloying (ESA) [1], which has a number of advantages in comparison with traditional methods of hardening by metallization, surfacing, plasma spraying, etc. Among these advantages, we note the high adhesion of the applied material to the substrate, during processing, as well as the simplicity of the equipment and process technology.

The paper presents the results of Tribological tests of samples of steel 45 (0,45%C) with electrospark coatings from a mixture of powders consisting of three components: Ti-Al-C, Ti-Al-N, Ti-Si-C. The choice of these materials is due to the fact that they ensure the formation on the working surfaces of the parts of the coating with high physical and mechanical characteristics. However, to obtain high-quality coatings with high continuity and uniformity in thickness, it was necessary to solve a number of technical problems such as:

- Development and production of special devices for the metered delivery of powdered material to the working area;
- Optimization of the graininess of the powder and energy regimes (the energy of electric pulses and the frequency of their succession) to ensure efficient processing of materials fed into the interelectrode gap.

It is established that the best quality of the formed coatings is obtained with the values of the energy of electric pulses in the range 0.75-1.2 Joules.

The highest value of the energy of electric pulses corresponds to powders with a higher melting point. Measurement of microhardness on the PMT-3 device at a load of 50 g showed that for all the coatings obtained it lies in the range of 850-1300 kgf / mm². Such a spread of microhardness values is due to the nonequilibrium structure of the formed coatings, which is a specific phenomenon for the method of electrospark alloying.

To assess the wear resistance of coatings obtained of steel 45 with ESA, the specified materials were tested on a friction machine of reciprocating type with an average sliding speed of the mobile sample 0.0675 m/s [2]. As a lubricant used vaseline oil. The counterbody was rectangular 3x25x30 samples from hardened steel 45 (HRC58). The contact of the counterbody with the test surface was carried out over an area equal to 9 mm² in such a way that the counterbody was perpendicular to this surface. The testing was carried out in two stages. At the first stage, the counterbody and the coating formed on the sample were run-in. It was conducted for ten hours of testing with a varying load of 2 to 9 kgf. In this case, run-in at the initial and final loads was carried out for two hours, and for intermediate loads - for an hour. At the second stage, tests were performed at a load of 9 kgf for 20 hours. The results obtained showed that all three types of coatings: Ti-Al-C; Ti-Al-N and Ti-Si-C at these loads have a higher wear resistance than 45 uncoated steel.

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