SEAE 23P INFLUENCE OF SLIDING DISTANCE AND LOAD ON WEAR OF ELECTROSPARK COATINGS

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It is known that coatings formed by electrospark alloying have high hardness and adhesion to the base material. Therefore, these coatings are widely used in various industrial fields. However, for a more targeted use of these coatings, more studies on friction and wear are necessary. The aim of this work was to obtain hard coatings on certain materials and the implementation of longer tests on friction and wear of these coatings. Tribological tests of the coatings where carried out in a tribological laboratory of the Aleksandras Stulginskis University (Kaunas, Lithuania) using an upgraded friction machine SMC-2. Electric-spark coatings have been tested at loads of 300 and 900 N and the sliding distance was 90,000 m and 30,000m, respectively. The coatings were tested for friction and wear with discs (d = 35 mm) of the 45 HRC 50-52steel, which rotated at 600 rev/min in a 15W-40 engine oil. The test began with a load of 100 N, and then the load was increasing every minute at 100 N. The load was adjusted for 2 - 8 minutes to a work load of 300 - 900 N. We investigated the coatings obtained on the OT4 titanium alloy from graphite + molybdenum + graphite, T15K6 carbide + graphite and graphite. Also we tested molybdenum coatings on steel 45.

The wear of the samples was determined using the method of weighing on the electronic scales with an accuracy up to 0.1 mg. After the wear tests, the surfaces of friction of the samples (which had the shape of segments) and discs were profilographed using a Mahr GmbH Gottigen Typ ST 500 profilograph; the microimages were taken at a NICON ECLIPSE MA-100 optical microscope. Microhardness of the coatings was determined using a PMT-3 microhardness tester.

It is found that when the load on the pair of friction decreases three times: from 900 N to 300 N, and the sliding distance increases 3 times: from 30,000 m to 90,000 m, the wear of coatings and discs becomes significantly different from the wear of coatings and discs tested under a load of 900 N and the sliding distance of 30,000 m. So the wear of coatings from OT4 + T15K6 (the energy of a single electric discharge - W = 0.9 J) + graphite (0.3 ... 0.9) and OT4 + graphite (W = 3 J) has increased by 2 times, and the wear of coatings from OT4 + graphite (W = 3 J) + Mo (W = 0.9) + graphite (W = 3 J) increased 1.5 times. However, molybdenum coatings on steel 45 behaved differently. Thus, at the load of 300 N and a sliding distance of 90,000 m, the wear was 3 times lower than at a load of 900 N and a sliding distance of 30,000 m. It is specified that the wear of discs that used with molybdenum coatings also decreased three-fold.

It is shown that under a load of 300 N and a sliding distance of 90,000 m, the wear of discs tested with coatings of OT4 + T15K6 (W = 0.9 J) + graphite (0.3 ... 0.9) and OT4 + graphite (W = J 3) increased 1.36 times (U_{disc} = 127 mg) and 1.6 times (U_{disc} = 112 mg), respectively. However, the wear of the disc tested with the coating from the OT4 + graphite (W = 3 J) + Mo + (W = 0.9) + graphite (W = 3 J) decreased 1.45 times.

It is found that it is better to use the molybdenum coatings on the 45 steel them in the friction pairs with the 45 HRC50-52 steel at load of 300 N (surface pressure of about 10-20 MPa), since this increases the durability of the friction pair more than 10 times, compared to that of the friction pairs used at a load of 900 N. It is shown that this coating has the highest anti-wear properties among all coatings studied in this paper. This can be attributed to the fact that the molybdenum coating is more uniform and it positively affects the formation of a more perfect tribological contact.

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