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STUDY OF THE TRIBOLOGICAL PERFORMANCE OF BORIDED AISI M2 STEEL SUBSTRATES USING THE PIN-ON-DISC TEST

This study was carried out to characterize a boride layer obtained by thermochemical boriding treatment and to evaluate its tribological performance. AISI M2 steel substrates with an initial surface roughness Ra=0.2 μm were borided by powder packing technique, using the following combinations of temperature and exposure time: 1123 K for 2 h, 1123 K for 4 h, 1148 K for 3 h and 1173 K for 2 h. The phase type, microstructure, surface roughness and nanohardness of the boride layer formed on the surface of AISI M2 steel substrates were investigated by XRD, SEM, contact profilometer and instrumented indentation tests, respectively. Subsequently, tribological pairs formed by the resulting boride layer and an alumina sphere (static partner) were subjected to a wear test using the pin-on-disc test, under dry conditions and at room temperature. In addition, the curves of the friction coefficient as a function of distance were obtained. The results of this study showed that a single-phase Fe2B boride layer was formed on the surface of the borided substrates. At the surface of the Fe2B single-phase boride layer, the average depth of the valleys (0.95-1.49 μm) was greater than the average height of the peaks (0.81-1.26 μm). The coefficient of friction of the borided substrates was lower (0.51-0.75) compared to that of the unborided substrate (0.81). The average depth of the wear track formed on the borided substrates (1.63-3.31 μm) was less compared to that of an unborided substrate (22.58 μm). In the borided substrates there was a coexistence of a high coefficient of friction and high wear resistance, and vice versa; while in the unborided substrate there was a coexistence of a high coefficient of friction and low wear resistance.

Keywords

boriding, pin-on-disc, friction, wear

Reference

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