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Tribocorrosion and cytotoxicity of FeB-Fe_2B layers on AISI 316 L steel

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Abstract

New results about the tribocorrosion resistance and cytotoxicity of FeB-Fe_2B layer developed by the powder-pack boriding process on the surface of AISI 316 L steel are presented in this work. Initially, the tribocorrosion tests in the borided AISI 316 L steel and the untreated material (AISI 316 L steel) were performed in Hank's solution, using a ball-on-flat configuration, which was connected with a three electrode-chemical cell. The sliding tests, in the presence or absence of corrosion, was performed under 20 N normal force using an alumina ball as a counter body. For the overall experimental conditions, the material loss for each material was estimated according to the ASTM G119 procedure. Further, the *in vitro* cytocompatibility of FeB-Fe_2B layer on AISI 316 L steel and the untreated material was evaluated by the indirect contact method, in which cell lines of immortalized human fibroblast (CHON-002) and normal renal epithelium of Cercopithecus aethiops (Vero) were used.

The results showed that the presence of FeB-Fe_2B layer on the AISI 316 L steel improves the tribocorrosion resistance 1.5 times than that of the untreated material, with a presence of a wear-corrosion degradation mechanism in contrast with a wear-dominated regime for the untreated material. Finally, the cytotoxicity tests revealed satisfactory properties in terms of effects on survival and proliferative activity of human fibroblasts and Vero cells on the surface of the borided AISI 316 L steel.

Keywords: boriding; boride layers; tribocorrosion; cytotoxicity; Hank's solution; degradation mechanisms.

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