

Tribological behaviour of ion-implanted Ti6Al4V sliding against polymers

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WEAR 209 (1997) 49-56

The effect of ion implantation of various elements (C, N, O, Y, Hf, Pt, Au) with different energy-dose combinations on the tribological behaviour of the alloy Ti6Al4V was investigated. Wear tests were performed with flat alloy specimens sliding against PMMA pins and UHMWPE discs, yielding the following results. The wear resistance of Ti6Al4V against PMMA increases with the microhardness in the implanted region. Wear and friction of Ti6Al4V/UHMWPE couples are decreased by implantation of noble metals as well as nitrogen or carbon. The removal of oxide particles from the alloy surface is greatly reduced, owing to the formation of titanium compound precipitates. The most pronounced wear reduction occurs when the enrichment of implanted atoms starts directly below the oxide film on the titanium surface, followed by a continuous decrease of the concentration of implanted atoms with increasing depth.