

Wear and Tribo-Corrosion Behavior of Laser Surface Alloyed Ti6Al4V with Ti, C and Ti + C

Sisa Pityana

Council for Scientific and Industrial Research (CSIR)

Meiring Naude Drive, Pretoria, 0184

Email: SPityana@csir.co.za

This study concerns evaluation of wear (against WC ball) and tribo-corrosion (against ZrO₂ ball in simulated body fluid) properties of alpha + beta titanium alloy (Ti6Al4V) laser surface alloyed with pure titanium (100% Ti), pure carbon (100% C) and a mixture of Ti + C (in the Ti to C ratio of 90:10 and 50:50). The alloyed zone microstructure consists of α and $\alpha\phi$ (100% Ti) and TiC and $\alpha\phi$ (for 100% C and a mixture of Ti + C). The average microhardness of the surface was found to be improved from 240 VHN for as-received sample to 501 VHN 2 630 VHN for laser surface alloyed one and increased with increasing carbon content. The Young's modulus was found to vary from 132 to 179 GPa as compared to 114 GPa of Ti6Al4V and increased with increase in carbon content. There is a marginal improvement in wear resistance due to laser surface cladding with 100% Ti and a significant improvement due to the addition of carbon. The coefficient of friction (COF) was also marginally reduced due to laser surface processing with 100% Ti and decreased with increasing carbon content. The mechanism wear was established. Tribo corrosion resistance in fretting wear mode against ZrO₂ in Hanks solution was found to be increased in terms of decrease in tribo-corrosion volume (0.35-0.24 mm³) and COF (0.43-0.29) as compared to as received Ti6Al4V (0.43 mm³ and 0.52)