

Synthesis and tribocorrosion performances of multilayer (Ta/ZrN)_n coatings

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Abstract: Multilayer thin coatings (~3 μm in thickness) were deposited using reactive radio frequency magnetron sputtering on Ti-6Al-4 V substrate for biomaterial applications. Films are a combination of hard zirconium nitride with pure tantalum, used to manage interfacial stress and to avoid crack growth. Alternating hard/ductile material is a biomimetic design inspired by nature (nacre-inspired materials). Tribocorrosion tests were performed in Hank's solution at 37 C, under open circuit potential by using a ball-on-disk reciprocating tribometer. A tendency to high resistance against corrosion was found for all the samples. Coatings with a top 100 nm thick ZrN layer showed more noble potential as well as a reduction of both the friction coefficient and the wear rate during the sliding phase. The principal wear mechanism is related to a tribocorrosion layer formation.

Keywords : Multilayer coating, Biomaterial, Tribocorrosion, Tantalum, Zirconium nitride, Magnetron sputtering