

Tribological properties of SiO₂/TiO₂ multilayer, TiO₂, SiO₂ coatings deposited on CP-Ti implant material in simulated body fluid (SBF) solution

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Abstract— In this study, the influences of different coatings on wear and scratch performances in simulated body fluid (SBF) solution were investigated. SiO₂/TiO₂ multilayer, TiO₂ and SiO₂ coatings were deposited on CP-Ti by sol-gel dip coating process and calcined at 700°C. The phase structure, crosssectional morphology, composition, wear track morphologies, adhesion properties, hardness and roughness of uncoated and coated samples were characterized with X-ray diffraction, scanning electron microscopy (SEM), scratch tester and 3D profilometer. Also, the tribological performances of all samples were investigated by a pin-on-disc tribo-tester against Al₂O₃ ball in SBF.

Results showed that hardness, wear and adhesion resistance of multilayer coated samples were higher than untreated CP-Ti. It was found that the values of these three properties of SiO₂/TiO₂ multilayer coatings were higher than other coatings. Additionally, the lowest friction coefficient and wear rates were obtained on SiO₂/TiO₂ multilayer coatings. Therefore, it was seen that phase structure, hardness and film adhesion were important factors on the tribological properties of multilayer coatings.

Keyword— *Multilayer coating; Sol-Gel; Wear; Scratch;*

Cp-Ti

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