

Surface performances of Ti-6Al-4V substrates coated PVD multilayered TiN/TiO_2 in biological environments

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Abstract: Multilayered and nanostructured coatings of Ti based alloys (oxides and nitrides) are elaborated and tested for increasing protective properties such as corrosion and wear resistances. A pin-on-disc tribometer was used to evaluate the wear resistance in Hank's solution against bovine bone. Corrosion behavior in Hank's solution was determined by potentiodynamic and electrochemical impedance spectroscopy techniques. Besides, the specimen surfaces were characterized by Atomic Force Microscopy (AFM), Scanning Electron Microscopy (SEM) and Energy Dispersive Spectroscopy (EDS) microanalyses. The results showed that optimal tribological properties were obtained in the case of coatings having TiN as top layer. The main wear mechanism was abrasive third bodywear. In vitro corrosion tests at 37 °C showed that the better corrosion resistance was obtained when TiN was the top layer. However all of them exhibited good tribological properties, good corrosion resistance and then may be promising options for biomedical applications.

Keywords : PVD coatings, oxides, Nitrides, Biomaterials, tribology, corrosion