Tribological and Eelectrochemical Characterization of a Titanium Alloy in a Physiological Solution.

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Abstract : Titanium alloys are used primarily for biomedical and / or dental applications. They are characterized by a better mechanical compatibility with the tissues and a good biocompatibility in the body fluids. The alloy TA6V4 used in orthodontics is subject to degradation by wear and corrosion. In this context, we are primarily interested in the study of the dry friction wear of the TA6V4 / Al2O3 torque by means of a rotating Ball / Disc tribometer. In order to evaluate the biocompatibility of this alloy, an electrochemical study in a physiological solution was carried out using conventional electrochemical measurement methods (time-dependent monitoring of the corrosion potential, potentiodynamic curve) as well as Electrochemical impedance spectroscopy. The results of tribology, the friction of the torque TA6V4 / Al2O3 against each other, revealed a friction coefficient of 0.2 and a wear volume of the order of 22.579.10-12 mm3/N.mm. The wear mechanism studied by scanning electron microscopy revealed abrasive and adhesive degradation. From the electrochemical point of view, the TA6V4 alloy in Hank's solution exhibited good corrosion resistance with a polarization resistance of 44 540 ?. Analysis by electrochemical impedance spectroscopy indicated that this alloy is passive in nature, following the formation of a surface-stable two-phase oxide layer composed of an internal compact layer which has good corrosion resistance And an external porous layer which is favorable to osteointegration.

Keywords : Alloy TA6V4, Corrosion behavior, friction