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IN VITRO CORROSION STUDY BY ELECTROCHEMICAL AND SURFACE ANALYSIS TECHNIQUES OF A TI50TA ALLOY FOR DENTAL APPLICATIONS

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Abstract

Commercial pure titanium (Cp-Ti) and titanium alloys are used on large scale in restorative dentistry due to their advantages as compared with other similar materials: chemical inertia, low density, high strength, high corrosion resistance in biological media and increased biocompatibility.The effect of fluoride and pH on the corrosion behaviour of Cp-Ti and a new Ti50Ta alloy were examined by open circuit potential (E_{OC}) measurement, linear polarization, potentiodynamic polarization and coulometric zone analysis. The surface of the specimen was analyzed by SEM microscopy after the potentiodynamic polarization. The passive behavior for both specimens is observed for artificial saliva (pH = 8), acidified saliva (9.8 g/L lactic acid, pH = 2.5) and for fluoridated saliva (1.0 g/L F^-, pH = 8). A decrease in corrosion resistance and less protective passive oxide films are observed for both specimens in fluoridated acidified saliva (9.8 g/L lactic acid, 1.0 g/L F^-, pH = 2.5), but Cp-Ti has a lower corrosion resistance in this electrochemical media, comparatively with the Ti50Ta alloy. The high corrosion of Ti50Ta alloy was caused by the surface enrichment of Ta_2O_5. Probable, Ta_2O_5 suppressed dissolution of Ti. The Ti50Ta alloy is expected to be useful as a new titanium alloy with high corrosion resistance in dental use.

Key words: corrosion resistance, dental application, potentiodynamic polarization, Ti50Ta alloy

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