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Effect of fluoride on the corrosion behavior of nanostructured Ti-24Nb-4Zr-8Sn alloy in acidulated artificial saliva

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Abstract

The surface of titanium dental implants is highly susceptible to aggressive fluoride ions in the oral environment. Nanotechnology has proven an effective approach to improve the stability and corrosion resistance of titanium by applying a passive film. In this study, we investigated the effects of fluoride on the corrosion behavior of nanostructured (NS) Ti-24Nb-4Zr-8Sn (Ti2448) alloy in acidulated artificial saliva (AAS) at 37 ^{o}C, and then conducted comparisons with its coarse grained (CG) counterpart. Electrochemical techniques, such as potentiodynamic polarization and electrochemical impedance spectroscopy (EIS), as well as surface analysis including X-ray photoelectron spectroscopy (XPS) with argon ion sputtering, and scanning electronic microscopy (SEM) were employed to evaluate the effects of fluoride on sensitivity to pitting and the tolerance of Ti2448 to fluoride in AAS solution. The results demonstrate that corrosion current density increased with F^-