Corrosion behavior of mechanically alloyed and sintered Ti+Ti_6Si_2B alloys in the artificial saliva, saline and simulated body fluid media

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Titanium alloys are widely used for dental, medical, and aerospace applications due to their chemical, physical, and mechanical properties [1,2]. Orthopedic Ti–10Si–5B implants present good bone compatibility as well as the Ti+Ti_6Si_2B alloys exhibit higher oxidation resistance than the Ti+Ti_5Si_3 alloys [3,4]. In this way, the corrosion behavior of mechanically alloyed and sintered Ti-10Si-5B, Ti-20Si-10B and Ti-22Si-B alloys was evaluated in according to the AFNOR NF S91-141 artificial saliva, ASTM B117 saline, and AFNOR S90-701 simulated body fluid standard procedures using the potentiodynamic polarization methods. Microstructures based on the Ti and Ti_6Si_2B phases were confirmed by scanning electron microscopy (SEM), X-ray diffraction (XRD), and energy dispersive spectrometry (EDS). Microstructures based on the Ti and Ti_6Si_2B phases were confirmed by scanning electron microscopy (SEM), X-ray diffraction (XRD), and energy dispersive spectrometry (EDS). The Ti-10Si-5B and Ti-20Si-10B alloys showed a corrosion potential around -0,4V, which resulted in better corrosion resistance compared with Ti-22Si-11B since this one resulted in a corrosion potential around -1,0V. In addition, the current density at the active-passive transition decreases in Ti-10Si-5B and Ti-20Si-10B alloys, which indicates the passivation process initiated faster than in Ti-22Si-11B alloy. Similar results were found for corrosion tests in saline and simulated body fluid media, indicating that the corrosion resistance is increased with the increasing of Ti_6Si_2B in alloy. The authors thank FAPEMIG, CNPq, CAPES and FAPESP for the support they have received in their research.

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