

Biocompatibility and Electrochemical Assessment of Biomedical Ti-24Nb-4Zr-8Sn Produced by Spark Plasma Sintering

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Abstract : In this study, biocompatibility evaluation of nanostructured near beta Ti-24Nb-4Zr-8Sn (Ti2448) alloy with non-toxic elements produced utilizing Spark plasma sintering (SPS) of very fine microsized powders attained through mechanical alloying was performed. The results were compared with pure titanium and Ti-6Al-4V (Ti64) alloy. Cell proliferation test was performed using murine osteoblastic cells, MC3T3-E1 at two cell densities; 400 and 4000 cells/mL for 7 days incubation. Pure titanium took a lead under both conditions suggesting that the presence of other oxide layers influence cell proliferation. No significant difference in cell proliferation was observed between Ti64 and Ti2448. Potentiodynamic measurement in Hanks, 0.9% NaCl and cell culture medium showed no distinct difference on the anodic polarization curves of the three alloys, indicating that the same anodic reaction occurred on their surface but with different rates. However, Ti2448 showed better corrosion resistance in cell culture medium with a slightly lower corrosion rate of 2.96 nA/cm² compared to 4.86 nA/cm² and 5.62 nA/cm² of Ti and Ti64 respectively. Ti2448 adsorbed less protein as compared to Ti and Ti64 though no notable difference in surface wettability was observed.

Keywords : biocompatibility, osteoblast, corrosion, surface wettability, protein adsorption

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