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Effect of Sintering Time and Porosity on Microstructure, Mechanical and Corrosion Properties of Ti6Al15Mo Alloy for Implant Applications

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Abstract : The requirement of artificial prostheses (such as hip and knee joints) has increased with time. Many researchers are working to develop new implants with improved properties such as excellent biocompatibility with no tissue reactions, corrosion resistance in body fluid, high yield strength and low elastic modulus. Further, the morphological properties of the artificial implants should also match with that of the human bone so that cell adhesion, proliferation and transportation of the minerals and nutrition through body fluid can be obtained. Present study attempts to make porous Ti6Al15Mo alloys through powder metallurgy route using space holder technique. The alloy consists of 6wt% of Al which was taken as α phase stabilizer and 15wt% Mo was taken as β phase stabilizer with theoretical density 4.708. Ammonium hydrogen carbonate is used as a space holder in order to generate the porosity. The porosity of these fabricated porous alloys was controlled by adding the 0, 50, 70 vol.% of the space holder content. Three phases were found in the microstructure: α, α_2 and β phase of titanium. Kirkendall pores are observed to be decreased with increase of holding time during sintering and parallelly compressive strength and elastic modulus value increased slightly. Compressive strength and elastic modulus of porous Ti-6Al-15Mo alloy (1.17 g/cm3 density) is found to be suitable for cancellous bone. Released ions from Ti-6Al-15Mo alloy are far below from the permissible limits in human body.

Keywords : bone implant, powder metallurgy, sintering time, Ti-6Al-15Mo
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