World Academy of Science, Engineering and Technology
International Journal of Materials and Metallurgical Engineering
Vol:12, No:04, 2018

Porous Titanium Scaffolds Fabricated by Metal Injection Moulding Using Potassium-Chloride and Space Holder

Authors : Ali Dehghan Manshadi, David H. StJohn, Matthew S. Dargusch, M. Qian

Abstract : Biocompatible, highly porous titanium scaffolds were manufactured by metal injection moulding of spherical titanium powder (powder size: -45 µm) with potassium chloride (powder size: -250 µm) as a space holder. Property evaluation of scaffolds confirmed a high level of compatibility between their mechanical properties and those of human cortical bone. The optimum sintering temperature was found to be 1250°C producing scaffolds with more than 90% interconnected pores in the size range of 200-250 µm, yield stress of 220 MPa and Young's modulus of 7.80 GPa, all of which are suitable for bone tissue engineering. Increasing the sintering temperature to 1300°C increased the Young's modulus to 22.0 GPa while reducing the temperature to 1150°C reduced the yield stress to 120 MPa due to incomplete sintering. The residual potassium chloride was determined vs. sintering temperature. A comparison was also made between the porous titanium scaffolds fabricated in this study and the additively manufactured titanium lattices of similar porosity reported in the literature.

Keywords : titanium, metal injection moulding, mechanical properties, scaffolds
Conference Title : ICPM 2018 : International Conference on Powder Metallurgy
Conference Location : London, United Kingdom
Conference Dates : April 24-25, 2018