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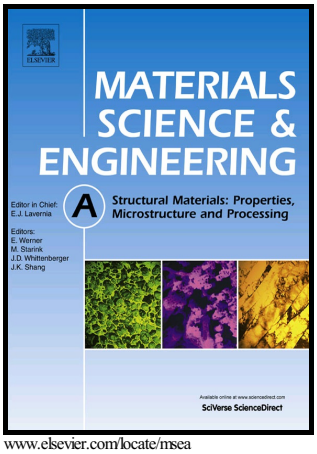

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Finite Element Analysis of Porous Commercially Pure Titanium for Biomedical Implant Application

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ABSTRACT

In biomedical implant applications, porous metallic structures are particularly appealing as they enhance the stiffness compatibility with the host tissue. The mechanical properties of the porous material are critically affected by microstructural features, such as the pore shape, the distribution of porosity, and the level of porosity. In this study, mechanical properties of porous commercially pure titanium structures with various porosity levels were investigated through a combination of experiments and finite element modelling. Finite element simulations were conducted on representative volume elements of the microstructure to assess the role of pore parameters on the effective mechanical properties. Modelling results indicated that the shape of the pore, in addition to porosity level, play a significant role on the effective behaviour. Finite element simulations provide reasonably accurate prediction of the effective Young's modulus, with errors as low as 0.9% for porosity of 35%. It was observed that the large spread in yield strength produced by the simulations was most likely due to the