Fabrication and characterization of nanostructure diopside scaffolds using the space holder method: Effect of different space holders and compaction pressures

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Abstract

Diopside ($CaMgSi_2O_6$) ceramic with its biodegradable and bioactive characteristics can be a very good candidate in making tissue engineering scaffolds; however, few studies have been conducted in this area. In this study, for the first time, 3D macroporous nanostructure diopside scaffolds were fabricated using the space holder technique. X-ray diffraction (XRD), transmission electron microscopy (TEM) and scanning electron microscopy (SEM) were used to analyze the composition, particle size, microstructure, pore size distribution, pore morphology, and pore interconnectivity of the diopside scaffolds. Immersion test in simulated body fluid (SBF) was employed to evaluate the degradation and in vitro bioactivity of the scaffolds. The results showed the successful fabrication of highly porous diopside scaffolds (53 – 85% porosity) with macropore sizes in the range of 150 – 600 μm and compressive strength in the range of 0.98 – 8.17 MPa. The prepared scaffolds with appropriate mechanical strength and pore size could satisfy the criteria required for an ideal scaffold in tissue engineering applications.