Fabrication of Macroporous Glass－Ceramic Scaffolds for Tissue Engineering

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ABSTRACT

Bone replacements are frequently required to substitute damaged tissue due to any trauma, disease or surgery. Some of the therapies are employed in order to solve these problems by the using of autografts, allografts or xenografts. Artificial grafts (scaffolds) are interesting and challenging candidates for stimulating bone regeneration and for supporting the newly formed bone. Three-dimensional (3D) scaffolds should show a highly porous, open structure to allow a proper vascularisation of the implant, as well as the flow of nutrients and waste products through the scaffold. Within ceramics, hydroxyapatite (HAp), β－tricalcium phosphate (β－TCP) and more recently bioactive glasses and glass-ceramic containing apatite and wollastonite are the most investigated materials as scaffolds for guided bone regeneration. In this work, efforts were focused on development of bioactive glass-ceramic (45S5R) macroporous scaffold using rice husk as a pore former. The results showed that after a heat treatment at 450 °C to 1050°C for one hour in air ; the crystallized phases of apatite and $Na_2Ca_2Si_3O_9$ in the specimen were determined by X－ray diffraction. In the present study three different particle sizes and contents of stearic acid additive were used to produce porous structures. The pore size and open porosity of the produced specimens were measured by scanning electron microscopy and Archimede ’ s methods. The green bodies were sintered at 1050°C for one hour. As a result, porous specimens with the open porosity of 47.2±2.7% and with the macropore size of 600±15 μm and 65±25 μm were fabricated. Morphological observations showed that the obtained SA75P3 are good candidates as scaffods.

Keywords : Glass－ceramic ; Macroporous ; Scaffold

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