Investigations of Porous Bioglass-Ceramic Materials

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ABSTRACT

The bioglass powders of MgO-CaO-Al2O3-SiO2-P2O5 system produced in this study were each mixed with stearic acid, pressed into shape and sintered in air, respectively. The bioglass with chemical composition of MgO 3.0%, CaO 35.0%, Al2O3 8.6%, SiO2 41.4% and P2O5 12.0% was studied. The results respectively showed that after a heat treatment at 960°C and 1060°C for one hour in air ; the crystallized phases of apatite and anorthite 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 (content of 50vol%) were sintered at 960°C for one hour. As a result, porous specimens with the open porosity of 29.94±1.14%, 27.67±0.94%, 18.67±0.97% and with the macropore size of 448±67 μm, 251±42 μm, 59±12 μm were fabricated. Porous specimens are fabricated in the total porosity range from 26.96±1.03 to 45.89±0.17% after sintering. Elastic modulus and bending strength at the total porosity of 26.96±1.03% are found to be similar to those of human cortical bone. Regarding mechanical properties of the other specimens could be ranged between cortical and cancellous bone. Formation of the crystals on porous bioglass-ceramic surfaces in simulated body fluid after 30 days was investigated. Besides, SA50P1 was shown to be a good biocompatibility by MTT assay.

Keywords : scaffolds ; porous bioglass ceramics ; stearic acid ; sintering ; pore size ; mechanical properties

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