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Influence of process characteristics on the scaffold architecture: From orthogonal quasi-cylindrical channels with controlled connectivity to laminated morphology

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Precise control of scaffold porosity and internal pore architecture parameters (e.g. pore geometry, size, interconnectivity and orientation) is necessary to maximize nutrient diffusion, control cell growth and function and optimize scaffold mechanical function. There are different techniques to design and fabricate three-dimensional scaffolds for tissue engineering. Specifically, the fabrication of highly regular structures is performed by the methods of rapid prototyping or solid free form. However, use of these methods requires usually special equipments.

The objective of this work was to study the influence of processing parameters (pressure, time and number of sheets) on the pore morphology, porosity and thickness of scaffolds fabricated via a modified solvent casting and particulate leaching method

Acrylates and methacrylates polymer scaffolds were obtained using sheets of fabrics as a porogenic material. The sheets were pilled and thermal compressed at 180°C under different pressures for certain time periods obtaining a template. Then, the template was sintered in an oven at 220°C for ten minutes. Afterwards, the template was placed in a mold where the polymerization was carried out. Finally, the template was eliminated with the proper solvent. The scaffolds were characterized by standard SEM and porosity. SEM micrographs show from a highly regular structure which consists of orthogonal quasi-cylindrical channels which are parallely aligned with controlled connectivity to a laminar structure.

Pore morphology and porosity of the scaffold can be modified by a thermal compression process. The thickness of the scaffolds can be varied by changing the number of sheets that are stacked and/or pressure.

Biography

L. Santos Esteve is pursuing her PhD from Departament d'Enginyeria Química, Universitat de València, Spain. She has completed her Advanced Studies Diploma (MS equivalent). À. Berna is Doctor and professor of Chemical Engineering at the Universitat de València, Spain.

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