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Porous structures from nanocellulose and biopolymers for biomedical application

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Bacterial cellulose has attracted a lot of interest in the last years due to its extraordinary properties for biomedical applications, high purity, water-uptake capability, good biocompatibility, cell adhesion, proliferation, good mechanical properties and non-toxicity of itself and its degradation products. A key element in tissue engineering is the 3D biomaterial scaffold which mimics the architecture of the Extra Cellular Matrix (ECM). ECM provides structural support for cell attachment, proliferation and differentiation. For this purpose, the 3D scaffolds should possess a network of interconnected pores ensuring cell migration, diffusion of nutrients and clearance of wastes and promoting cell adhesion and cell growth. More than 80% porosity is requested for porous scaffolds to mimic native ECM. Many tissues like heart, cartilages or bones have a fiber-sponge complex architecture and the nanofibrillated network of bacterial cellulose is similar to native ECM as respects biocompatibility, fibers size and assembling. However, the pore size of the cellulose network is much too low than the recommended minimum pore size of 100 microns, which limits cell penetration and migration. Hear we propose new methods to obtain porous biocomposite scaffolds using bacterial cellulose and eco-friendly additives and processes. Bacterial cellulose was modified with different agents and crosslinkers and the properties of the new porous structures were investigated by thermogravimetric analysis, atomic force microscopy, scanning electron microscopy, Fourier transform infrared spectroscopy and dynamic mechanical analysis. This study has shown that highly porous cellulose structures that combine lightweight and stiffness may be obtained by using simple and eco-friendly methods.

Biography

Denis Mihaela Panaitescu has completed her PhD from University Politehnica of Bucharest, Romania. She is a Senior Researcher at ICECHIM. She has published more than 70 papers in reputed journals and has managed several national projects.

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