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Osteoconductive performance of carbón nanotube scaffolds homogeneously mineralized by flow-through electrodeposition

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The treatment of bone lesions, including fractures, tumor resection and osteoporosis, is a common clinical practice where bone healing and repair are pursued. It is widely accepted that calcium phosphate-based materials improve integration of biomaterials with surrounding bone tissue and further serve as a template for proper function of bone-forming cells. Within this context, mineralization on preformed substrates appears as an interesting and successful alternative for mineral surface functionalization. However, mineralization of "true" 3D scaffolds –in which the magnitude of the third dimension is within the same scale as the other two– is by no means a trivial issue because of the difficulty to obtain a homogeneous mineral layer deposited on the entire internal surface of the scaffold. In this talk, we will describe how a "flow-through" electrodeposition process is applied for mineralization of 3D scaffolds composed of multiwall carbon nanotubes and chitosan. We demonstrated that, irrespective of the experimental conditions used for electrodeposition (e.g., time, temperature and voltages), the continuous feed of salts provided by the use of a flow-through configuration is the main issue if one desires to coat the entire internal structure of 3D scaffolds with a homogeneous mineral layer. Finally, mineralized scaffolds not only showed a remarkable biocompatibility when tested with human osteoblast cells, but also enhanced osteoblast terminal differentiation (as early as 7 days in calcifying media).

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