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Direct building of 3D microchannel structure for nutrients delivery

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Next generation of the hard tissue scaffolds will be made to accommodate nutrient channels to support cells live inside of the 3D scaffold. Nowadays, diffusion through scaffold and a tissue usually limits transport, and forms potentially hypoxic regions. Hydroxyapatite is biocompatible material that supports cell adhesion and proliferation, therefore ideal for the preparation of bone grafts. Furthermore, chemical stability of this bioceramic material allows stable liquid flow through a porous structure. In this study, a 3D hydroxyapatite structure containing microchannels via microtemplating was prepared. Coating: The method uses micro fibers coated by hydroxyapatite suspension, which are sintered to achieve micro-channels and replicate shape of the fiber. High mechanical flexibility in the green stage allows direct shaping into 3D structure. Sintered structures contains asymmetric membrane walls with flux suitable for nutrition delivery, which keeps microchannels for nutrition support and waste removal separated from cell growth area. The metabolic activity of the cells was determined and the cell morphology was visualized. The ability for these structures to support cell adhesion and proliferation was shown to be favorable over a period of 7 days. The presented straightforward concept for building 3D structure containing tailored microchannels should be suitable especially for bioreactors applied as a bone grafts.

Biography

David Salamon has completed his PhD from Slovak Academy of Sciences and Post-doctoral studies from Stockholm University. He has worked 4 years at University of Twente, Netherlands and joined newly opened Central European Institute of Technology at Brno University of Technology in year 2012 as a Researcher. He has published more than 23 papers in journals, one book chapter and his research activity is mainly in area of processing of advance ceramic materials.

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