



Synthesis of CaCO₃ scaffolds for bone tissue engineering

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Abstract:

It is well known that bioactive ceramics exhibit specific biological affinities, especially in the area of tissue regeneration. In this context, we report the development of an eminently scalable, novel, supercritical CO₂ based process for the fabrication of hierarchically porous “soft” CaCO₃ scaffolds on silicon substrates. Exposure of these CaCO₃ scaffolds to monocytic THP-1 cells yielded negligible levels of tumor necrosis factor-alpha (TNF- α) thereby confirming the lack of immunogenicity of the scaffolds. ECM protein treatment of the scaffolds showed enhanced adsorption comparable to standard control such as glass. In vitro studies using osteoblast precursor cell line, MC3T3, also demonstrated the cytocompatibility of hierarchical porous CaCO₃ scaffolds. Moreover, the CaCO₃ scaffolds stimulated matrix mineralization (calcium deposition), an end point of advanced osteoblast differentiation and an important biomarker for bone tissue formation. Taken together, these results demonstrate the significant potential of the hierarchically porous CaCO₃ scaffolds for bone tissue engineering applications

Biography:

Sudhir Sharma obtained master's (MSc Physics and MTech Materials) from Department of Physics, Barkatullah University (formerly Bhopal University) Bhopal, India. Sharma received PhD in development of shape memory micro-actuators at Department of Instrumentation and Applied Physics, Indian Institute of Science Bangalore (IISc. Bangalore), India. As post-doctoral fellow, he joined Centre for Nano Science and Engineering (CENSE), IISc. His research interest includes implementation of supercritical technologies for nanoparticle synthesis, Smart materials for micro-sensors and actuators, MEMS/NEMS and micro/nano-fabrications, vacuum science, and thin film technology.



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Recent Publications:

- Sudhir Sharma, Environ Sci Pollut Res Int, 2019
- Sudhir Sharma, Arch Environ Contam Toxicol, 2019.
- Sudhir Sharma, Chem Sci., 2018
- Sudhir Sharma, ACS Appl Mater Interfaces 2018
- Sudhir Sharma, Chemistry, 2018