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Synthesis of Highly Porous Cyclowollastonite Bioactive Ceramic

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Abstract : Recently bioactive ceramic materials have been applied in the biomedical field as bulk, granular, or coating materials for more than half a century. More recently, bone tissue engineering scaffolds made of highly porous bioactive ceramic, glass-ceramic, and composite materials have also been created. As a result, recent bioactive ceramic structures have a high bioactivity rate, an open pores network, and good mechanical characteristics simulating cortical bone. Cyclowollastonite frameworks are also suggested for use as a graft material. As a porogenous agent, various amounts of the polymethyl methacrylate (PMMA) powders were used in this study successfully to synthesize a highly interrelated, nanostructured porous cyclowollastonite with a large specific surface area where the morphology and porosity were investigated. Porous cyclowollastonite bioactive ceramics were synthesized with a cost-effective and eco-friendly wet chemical method. The synthesized biomaterial is bioactive according to in vitro tests and can be used for bone tissue engineering scaffolds where cyclowollastonite sintered dense discs were submerged in simulated body fluid (S.B.F.) for various periods of time (1-4 weeks), resulting in the formation of a dense and consistent layer of hydroxyapatite on the surface of the ceramics, indicating its good in vitro bioactivity. Therefore, the cyclowollastonite framework exhibits good in vitro bioactivity due to its highly interconnecting porous structure and open macropores. The results demonstrate that even after soaking for several days, the surface of cyclowollastonite ceramic can generate a dense and consistent layer of hydroxyapatite. The results showed that cyclowollastonite framework exhibits good in vitro bioactivity due to highly interconnecting porous structure and open macropores.

Keywords : porous, bioactive, biomaterials, S.B.F, cyclowollastonite, biodegradability
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