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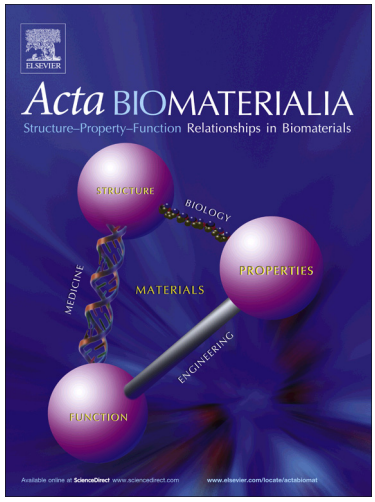

Full length article

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Porous calcium phosphate glass microspheres for orthobiologic applications

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Abstract

Orthobiologics is a rapidly advancing field utilising cell-based therapies and biomaterials to enable the body to repair and regenerate musculoskeletal tissues. This paper reports on a cost-effective flame spheroidisation process for production of novel porous glass microspheres from calcium phosphate-based glasses to encapsulate and deliver stem cells. Careful selection of the glass and pore-forming agent, along with a manufacturing method with the required processing window enabled the production of porous glass microspheres via a single-stage manufacturing process. The morphological and physical characterisation revealed porous microspheres with tailored surface and interconnected porosity (up to 76±5%) with average pore size of 55±8 μm and surface areas ranging from 0.34 to 0.9 m^2g^{-1}. Furthermore, simple alteration of the processing parameters produced microspheres with alternate unique morphologies, such as with solid cores and surface porosity only. The tuneable porosity enabled control over their surface area, degradation profiles and hence ion release rates. Furthermore, cytocompatibility of the microspheres was assessed using human mesenchymal stem cells via direct cell culture experiments and analysis confirmed that they had migrated to within the centre of the microspheres. The novel microspheres developed have huge potential for tissue engineering and regenerative medicine applications.