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# Glassy foam from cullet for biomaterials applications, comparison with 46S6 glass

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## Abstract

Materials for bone substitution applications currently include bioactive glasses that are capable of bonding to bone tissue. 46S6 bioglass is a reference material that is able to develop a biologically active hydroxy-carbonate apatite (HCA) layer on their surface when soaked in body fluid. Cellular glasses are commonly studied to copy the porous structure of natural bones.

The aim of this work is to study the feasibility to build a 3D macroporous glassy materials using a common silicate soda-lime cullet glass (~75SiO<sub>2</sub>-15Na<sub>2</sub>O-10CaO wt%) doped with different content of P<sub>2</sub>O<sub>5</sub> and to evaluate its biocompatibility with the 46S6 "standard" bioglass (46 SiO<sub>2</sub> - 24 Na<sub>2</sub>O - 24 CaO- 6P<sub>2</sub>O<sub>5</sub> wt%).

The foamy glasses are produced by using crushed clear cullet and calcium carbonate as foaming agent and by a thermal treatment of the mixture around 850°C. The route explored to incorporate P<sub>2</sub>O<sub>5</sub> in the final cellular material is achieved by the use of NH<sub>4</sub>H<sub>2</sub>PO<sub>4</sub> (MAP) or (NH<sub>4</sub>)<sub>2</sub>HPO<sub>4</sub> (DAP) as dopant precursors during the scaffold synthesis. The ratio Ca:P for the P<sub>2</sub>O<sub>5</sub> doped cullet based samples can be tuned from 5 to 1. Prepared foam materials and 46S6 samples were crushed and sieved under 40 micrometres particles for toxicity study. Human osteoblast cells Saos-2 and human endothelial cells EAhy926 were used for viability assays with two incubation duration 24 and 72h. Encouraging first results concerning cullet based powders for viability assays will be complemented with synthetic body fluid (SBF) study for HCA growth verification on the foam bulk samples.

**Keywords:** foam glass, cullet, biomaterials, cytotoxicity

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