The Influence of Different Buffer Solutions on the Wollastonite-based Cements for Bone Regeneration

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Calcium silicates are biomaterials with excellent biocompatibility, bioactivity and low toxicity which can be used as base materials to produce cements for replacing and/or repairing damaged bone tissue. Cements based on wollastonite ($CaSiO_3$) are formed from a reaction between a solution containing phosphate ions (PO_4^{3-}) and $CaSiO_3$powder, forming a paste that spontaneously hardens at room or body temperature. In this work, three different formulations of cement were produced, varying the concentration of PO_4^{3-}ions in the liquid phase (5.7, 6.6 and 7.3 M) to obtain a paste suitable for the intended applications. The materials produced were characterized by their physical and chemical properties by X-ray diffraction (XRD), infrared spectroscopy by Fourier transform (FT-IR) and Raman spectroscopy. The results obtained for the synthesized powders showed the formation of the parawollastonite phase (β-$CaSiO_3$) with a high degree of crystallinity and desired purity. Furthermore, the results of XRD, FT-IR and Raman confirm the presence of hydroxyapatite after the formation of cements. The cements were subjected to cohesion and cytotoxicity tests in a biological environment. Cements with a higher concentration of PO_4^{3-}present good cohesion, which makes it possible to use them to fill bone defects. The *in vitro* biocompatibility was confirmed by MTT assay, wherein no cytotoxicity of the cements was observed against murine embryonic fibroblast (MEF) cells. Our results provided valuable information for designing wollastonite-based cements with optimal handling, mechanical and biological properties.

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