

THE STUDY AND DEVELOPMENT OF CALCIUM PHOSPHATE BONE CEMENT AND HYDROXYAPATITE NANOFIBERS

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ABSTRACT

In order to have better understanding of the influence of the raw materials of calcium phosphate cements (CPCs), including both powder and liquid, on the properties of the of CPCs and eventually develop a way to better control and/or improve cement properties, we have 1) developed a liquid recipe primarily containing sodium hydrogen phosphate (Na_2HPO_4) and sodium dihydrogen phosphate (NaH_2PO_4), which can regulate the setting time, injectability and mechanical strength of tetracalcium phosphate (TTCP) - dicalcium phosphate (DCPA) cements, 2) applied various polymer additives, including chitosan lactate (chitosan), poly (ethyleneimine) (PEI) and poly (allylamine hydrochloride) (PAH) to tailor the setting time, injectability and mechanical properties of polymer-apatite cement as bone substitute, and 3) synthesized high aspect-ratio hydroxyapatite (HA) nanofibers, applied such HA nanofibers as additives to the cements, and also investigated the properties of the cement composites containing nanofibers. The chemical composition, microstructure, and mechanical properties of the raw materials and resulting calcium phosphate cements and composites have been characterized by X-ray Diffraction (XRD), scanning electron microscope (SEM), electron energy dispersive spectrometer (EDS), and Instron universal mechanical testing machine.