Development of a Novel Dental Filling Material Using Hydroxyapatite Derived from Waste Oyster Shells

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The present study aimed at developing a novel zinc phosphate based dental cement by adding Pentacalcium hydroxide triphosphate (hydroxyapatite) as a reinforcing filler to investigate the mechanical and elution properties of the prepared specimens. Here waste oyster shells of *Crassostrea madrasensis* were calcined to obtain Oxocalcium. The Calcium dihydroxide precursor for the synthesis of hydroxyapatite by wet precipitation method at room temperature was prepared by dissolving Oxocalcium in water. Synthesized hydroxyapatite was added into zinc phosphate powder in seven different ratios and specimens were fabricated. X-ray fluorescence spectroscopy results of oyster shells showed that Oxocalcium (88.5%) was the major oxide while Silicon dioxide and Iron (Ⅲ) oxide were present in trivial amounts. The stoichiometric calcium/phosphorus ratio of synthesized hydroxyapatite was close to 1.7. Both Fourier Transform Infrared spectroscopy and X-ray Diffraction results of unsintered and sintered hydroxyapatite were compatible with the results of the commercial compound. The particle size of the sintered hydroxyapatite was 1.518×10^{-6} m. Zinc phosphate cement with 10% hydroxyapatite was identified as the ideal percentage that showed the best mechanical and chemical properties with the highest compressive and diametral tensile strengths which were 66.85×106 Nm^{-2} are 18.88 Nm^{-2} respectively. Further, it showed the lowest elution percentage in pH 3 and 5 aqueous 2-Hydroxypropanoic acid and water. Hence hydroxyapatite synthesized from waste can be used as reinforcing filler in zinc phosphate dental cement.

Keywords: Zinc phospate dental cement, Hydroxyapatite, Crassostrea madrasensis, oysters