

## Preparation and Characterization of Calcium Phosphate Cement

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**Abstract :** Calcium phosphate cements (CPCs) is one of the most attractive bioceramics due to its moldable and shape ability to fill complicated bony cavities or small dental defect positions. In this study, CPCs were produced by using mixtures of tetracalcium phosphate (TTCP,  $\text{Ca}_4\text{O}(\text{PO}_4)_2$ ) and dicalcium phosphate anhydrous (DCPA,  $\text{CaHPO}_4$ ) in equimolar ratio (1/1) with aqueous solutions of acetic acid ( $\text{C}_2\text{H}_4\text{O}_2$ ) and disodium hydrogen phosphate dehydrate ( $\text{Na}_2\text{HPO}_4 \cdot 2\text{H}_2\text{O}$ ) in combination with sodium alginate in order to improve their moldable characteristic. The concentrations of the aqueous solutions and sodium alginate were varied to investigate the effects of different aqueous solution and alginate on properties of the cements. The cement paste was prepared by mixing cement powder (P) with aqueous solution (L) in a P/L ratio of 1.0 g/ 0.35 ml. X-ray diffraction (XRD) was used to analyses phase formation of the cements. Setting times and compressive strength of the set CPCs were measured using the Gilmore apparatus and Universal testing machine, respectively. The results showed that CPCs could be produced by using both basic ( $\text{Na}_2\text{HPO}_4 \cdot 2\text{H}_2\text{O}$ ) and acidic ( $\text{C}_2\text{H}_4\text{O}_2$ ) solutions. XRD results show the precipitation of hydroxyapatite in all cement samples. No change in phase formation among cements using difference concentrations of  $\text{Na}_2\text{HPO}_4 \cdot 2\text{H}_2\text{O}$  solutions. With increasing concentration of acidic solutions, samples obtained less hydroxyapatite with a high dicalcium phosphate dehydrate led to a shorter setting time. Samples with sodium alginate exhibited higher crystallization of hydroxyapatite than that of without alginate as a result of shorten setting time in basic solution but a longer setting time in acidic solution. The stronger cement was attained from samples using acidic solution with sodium alginate; however it was lower than using the basic solution.

**Keywords :** calcium phosphate cements, TTCP, DCPA, hydroxyapatite, properties

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