

# Physicochemical and biological properties of calcium phosphate/chondroitin sulfate bone cement containing tetracalcium phosphate nanorod powders

rahim jahandideh<sup>1</sup>, Aliasghar behnamghader<sup>1</sup>, and Saeed Hesarak<sup>1</sup>

<sup>1</sup>Materials and Energy Research Center

June 27, 2022

## Abstract

Tetracalcium phosphate (TTCP) is one of the main powder components in self-setting calcium phosphate cements for hard tissue applications. In this study, two types of calcium phosphate/chondroitin sulfate bone cements in which TTCP powders in nanoscale-rod like (R-TTCP) and micro-conventional irregular shape (C-TTCP) were used. The first one was synthesized by reverse microemulsion chemical process and the second one, was prepared by thermal conventional method. The results showed that both cements formed hydroxyapatite as the result of cementation process. The R-TTCP cement revealed a slightly longer initial but no difference in final setting time, less compressive strength, higher porosity and better degradation behavior compared to C-TTCP one. The both cements presented similar tendency to the formation of a dense hydroxyapatite on their outer surfaces through immersion in simulated body fluid. Taking into consideration the initial porosity, the cement made from R-TTCP rod like nanopowder presented more aptness to participate in ion exchange in SBF resulting to fill the 15% more initial porosity via the precipitation of hydroxyapatite mineral. From the biological point of view, analysis of cytotoxicity and MG63 osteoblastic-cell behavior proved that the both cements had good viability and proper cell adhesion and activity.

## Hosted file

Manuscript, R-TTCP.docx available at <https://authorea.com/users/491761/articles/574630-physicochemical-and-biological-properties-of-calcium-phosphate-chondroitin-sulfate-bone-cement-containing-tetracalcium-phosphate-nanorod-powders>