Mg and Zn Modified Calcium Phosphate Ceramics

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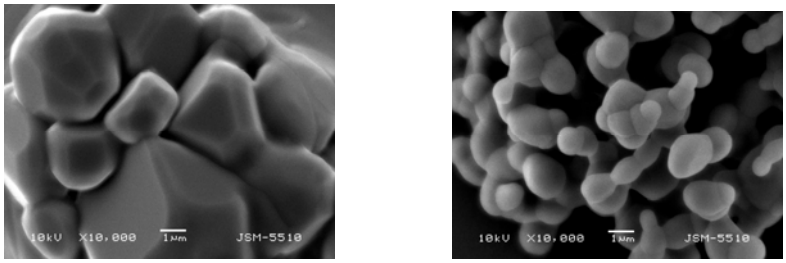
Ion modified calcium phosphate-based ceramics are designed to simulate the mineral composition of the hard bone tissues or to strengthen some specific biologically important behaviour. Thus the biological active Mg plays an important role in the formation and growth of the hard bone tissue and the Zn is extremely important mediator for more than 200 enzymes.

The present study aims to examine the effect of Mg^{2+} or Zn^{2+} ion substitutions on the phase composition of calcium phosphate ceramics, their morphologycal and structural changes. Chemical, XRD, FTIR and SEM methods have been applied for their characteristics.

Amorphous ion modified calcium phosphate precursors were precipitated in simulated body fluids modified by different amounts of Mg^{2+} or Zn^{2+} ions ($Me^{2+}/(Me^{2+}+Ca^{2+})$ was 0, 0.03, 0.07 and 0.13) at pH 8. Modified calcium phosphate ceramics with (Ca+Me)/P ratio of 1.3 - 1.4 were obtained after precursor lyophilization and sintering at 1000°C. Stabilization of β-tricalcium phosphate (β-TCP) structure occurs in the all cases of Zn^{2+} ions substitution for Ca^{2+} ions and formation of mono phased zinc-β-TCP ceramics with sizes (500–5000 nm) and idiomorphic crystals (Fig.1a) was registered. In the case of Mg^{2+} ions substitution for Ca^{2+} ions the concentration of Mg^{2+} ions is a crucial for the stabilization of β-tricalcium phosphate (β-TCP) structure. Mono phased magnesium-β-TCP ceramics with smaller size (100-500 nm) and spherical grains (Fig. 1b) were prepared when the $Mg^{2+}/(Mg^{2+}+Ca^{2+})$ ratio was 0.13. When this ratio was smaller (0.03 and 0.07) bi-phased ceramics consisting of magnesium-β-TCP and hydroxiapatite (HA) were obtained.



a b

Fig.1 SEM images of ion-modified mono-phased calcium phosphate ceramics: a) zinc-β-TCP; b) magnesium-β-TCP.

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