Substituting Hydroxyapatite with Magnesium and Strontium Using a Continuous Precipitation Method

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INTRODUCTION: Hydroxyapatite is a natural bone apatite in the physiological structure of bone. It is involved in bone regeneration and is widely used as synthetic bone filler or to provide attachment of bone to metal implants. However the slow degradation rate of hydroxyapatite compromises its osteogenic capacities.
In this project we aim to create a multi-substituted HAP (sHAP) with Mg and Sr to increase its solubility, osteogenic integrity and bioactivity with a continuous flow method.

METHODS: HAP was synthesized using a mixing column. Different substitution degrees were examined. Laminar flow in the column induced hydroxyapatite precipitation. Synthesis was carried out at room temperature and incubated over night at 37 °C under continuous stirring. HAP was tested via Fourier-transform infrared spectroscopy (FTIR) and inductively coupled plasma optical emission spectrometry (ICP-OES). Crystallinity was tested via X-ray diffraction (XRD)

RESULTS:
The results showed that the synthesis method used could successfully achieve the synthesis of multi-substituted hydroxyapatite and the incorporation of a high amount of ions. However, higher amount of Sr reduced the incorporation of Mg.

DISCUSSION & CONCLUSIONS: Our continuous wet method seems to lead to the successful substitution of hydroxyapatite. However we can see that high amounts of strontium reduced the incorporation of Mg, whereas high amounts of Mg, reduced the incorporation of Ca resulting in excess incorporation of Sr.

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