Transformation of synthetic and biogenic apatites in Mg^{2+} rich environment

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The substitution of bivalent cations exhibiting biological activity, such as Mg^{2+}, in apatite, the main mineral reservoir of calcium and phosphorus in vertebrates, is an intriguing research topic in biomaterial synthesis and fundamental biochemistry as well. In fact, it has been discovered recently that Mg^{2+} can incorporate in permanent tooth enamel introducing changes in crystal structure, hardness and whiteness of the enamel [1]. Deciduous dental enamel has some specific microstructural features which are different from permanent tooth enamel, e.g. the aprismatic outer layer, having a decisive role in mechanical response and also in corrosion resistance and caries evolution.

In this contribution we investigate structural and mechanical properties of deciduous dental enamel as a function of Mg^{2+} incorporation. Further, the surface composition is modified during ion-exchnage experiments and subsequent mechanical and structural changes are monitored. For comparison, the incorporation of Mg^{2+} in synthetic nanocrystalline hydroxylapatite (nHAP), amorphous calcium phospate nanoparticles (ACP) and a powder made from well crystalline apatite of geological origin (MAp) was also investigated.

Correlations between crystallinity, morphology and Mg^{2+} incorporation and the effect of Mg^{2+} on the mechanical properties of deciduous dental enamel are discussed.

[1] Abdallah, Eimar, Basset et al. (2016) *Acta Biomaterialia* **37** 174–183.