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Calcium hydroxyapatite - CaHAp, $Ca_5(PO_4)_3(OH)$, is the main component of vertebrate bones and teeth. CaHAp, is fundamental in biomedical applications because of its bioactivity, biocompatibility, and slow-degradation rate. Moreover, it is a critical bioceramic material due to its properties of osteoconduction, osteointegration, and osteoinduction. Accordingly, it is employed as a coating for the surfaces of implant metallic parts and as a bone filler to repair bone defects or for reconstructive bone replacement.
CaHAp has a role in catalysis, agricultural and pharmaceutical products, protein chromatography, and water and soil treatment as well.
The growth of large crystals is hard to perform in the laboratory. For that reason, the bulk of experimental investigations about synthetic CaHAp concerns nanosized crystals.
Most of the growth methods found in literature, require strongly basic pH values to obtain CaHAp crystals. Under these conditions, the supersaturation of the solution is too high to get large crystals and then a mass precipitation of nano-sized crystals is obtained.
As a consequence, information about surface and even bulk properties are lacking.
We obtained micron-sized CaHAp by modifying the procedure proposed by Perloff and Posner [1]. The method involves the hydrolysis of a calcium phosphate into CaHAp. Our micron-sized CaHAp crystals have been grown by lowering the nucleation frequency, and hence moving the system toward growth [2]. Then, we modified crystal size and morphology along with the surface quality, through the choice of different precursors [3].
The relationship between the CaHAp polymorphism, growth morphology and surface quality, results to be strongly dependent on the cooperative effect between the supersaturation of the solution and the epitaxy-ruled templating effect of the phases chosen as CaHAp precursors.

[1] A. Perloff, A.S. Posner *Science* **1956**, 583–584.
[2] L. Pastero, D.Aquilano *Cryst. Growth Des.* **2016**, *16*, 852−860.
[3] L. Pastero, *in prep.*