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Epitaxy-ruled growth of large Ca-hydroxyapatite crystals from aqueous solution

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Calcium hydroxyapatite is the main component of vertebrate bones and teeth. It has a strategic role in biomedical applications because of its bioactivity, biocompatibility, and slow-degradation rate. It is a critical bioceramic material due to its properties of osteo-conduction, -integration, and -induction. Moreover, hydroxyapatite has a role in catalysis, agricultural and pharmaceutical products, protein chromatography, and water and soil treatment as well.

The bulk of investigations about hydroxyapatite concerns nanosized crystals. The growth of large crystals is difficult to perform in the laboratory. Most of the growth methods proposed by literature, require high pH values (usually ranging between 10 and 12) to obtain the hydroxyapatite mass precipitation; under these conditions, the supersaturation of the solution is too high to obtain large crystals. Indeed, in most cases, only nanosized hydroxyapatite crystals are obtained. For that reason, nothing about surface properties and quality has been mentioned. Information about surface and even bulk properties are lacking.

We obtained micron-sized hydroxyapatite crystals by lowering the nucleation frequency, and hence moving the system toward growth [1].

Then, we modified crystal size and morphology and surface quality by changing the precursor phase [2].

The relationship between the hydroxyapatite polymorphism, growth morphology, and surface quality, result to be strongly dependent on the synergic effect between the supersaturation of the solution and the epitaxy-ruled templating effect of the phases used as hydroxyapatite-precursor.

[1] Linda Pastero, Dino Aquilano (2016) Monetite-Assisted Growth of Micrometric Ca-Hydroxyapatite Crystals from Mild Hydrothermal Conditions. Cryst. Growth Des. ***2016****, 16, 852−860. DOI: 10.1021/acs.cgd.5b01431*

[2] Linda Pastero, in prep.