NOVEL METHOD FOR PRECIPITATION OF CALCIUM CARBONATE POLYMORPHS OF UNUSUAL MORPHOLOGIES

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Precipitation processes of carbonate particles of different size, shape, and surface properties have been intensively investigated due to their importance in geo- and biosciences, and in numerous industrial applications. A novel precipitation processes, effectuated through catalytic decomposition of urea at elevated temperatures and by using enzyme urease, was employed to precipitate calcium carbonate polymorphs in a reacting solution of calcium salts (1-2). The structure and morphology of obtained precipitates were investigated using scanning electron microscope (SEM) and X-ray diffraction (XRD). The effects of various experimental conditions on the precipitation processes, such as the concentration of reactants, temperature, aging time, agitation and mixing procedures were investigated. It was found that the formation of different polymorphs of calcium carbonate, characterized by unusual and fascinating morphologies, was effected mostly by agitation and concentration of reactants as well as by mixing procedures. This study also exemplifies recently renewed mechanism in which some of carbonate colloids can be formed through aggregation of preformed nanosize crystalline particles (3,4). Understanding of the latter processes may lead to new strategies for the synthesis of calcium carbonate precipitates of desirable structural and morphological properties.

Literature:

Scanning electron micrographs (SEM) of obtained calcium carbonate particles: (a) spherical vaterite particles, (b,c) “flower-type” vaterite particles, (d) “needle-like” aragonite particles, (e) “root-type” aragonite particles, and (f) “screw-growth” rhombohedra of calcite particles.