

A novel catalytic method for the synthesis of spherical aragonite nanoparticles from cockle shells

ABSTRACT

For the first time, we report here a novel top down catalytic approach for the synthesis of aragonite nanoparticles with spherical morphology from cockleshells. Cockle shell is a natural reservoir of aragonite which is a biogenic polymorph of calcium carbonate. Aragonite polymorph is widely used in the repair of fractured bone, development of advanced drug delivery systems, and tissue scaffolds. The method involves an easily performable and low-cost mechanical stirring of the micron-sized cockle shell powders in presence of a nontoxic biomineralization catalyst, dodecyl dimethyl betaine (BS-12). It produces spherical shaped aragonite nanoparticles of 35 ± 5 nm in diameter with a good reproducibility and without any additional impurities at room temperature. The findings were verified with a variable pressure scanning electron microscopy (VPSEM), energy dispersive X-ray spectroscopy (EDX), transmission electron microscopy (TEM), Fourier transmission infrared spectroscopy (FT-IR), X-ray diffractometer (XRD), and thermogravimetric analyzer (TGA). The reproducibility, low-cost and simplicity of the method suggested its potential applications in large scale synthesis of aragonite nanoparticles with spherical morphology in an industrial set up.

Keyword: Top down catalytic approach; Biomineralization catalyst; Spherical morphology; Biogenic aragonite polymorph