

## Cockle shell-derived calcium carbonate (aragonite) nanoparticles: a dynamite to nanomedicine

### ABSTRACT

Cockle shell is an external covering of small, salt water edible clams (*Anadara granosa*) that dwells in coastal area. This abundant biomaterial is hard, cheap and readily available with high content of calcium carbonate in aragonite polymorphic form. At present, cockle shell-derived calcium carbonate nanoparticles (CSCaCO<sub>3</sub>NPs) with dual applications has remarkably drawn significant attention of researchers in nanotechnology as a nanocarrier for delivery of different categories of drugs and as bone scaffold due to its beneficial potentials such as biocompatibility, osteoconductivity, pH sensitivity, slow biodegradation, hydrophilic nature and a wide safety margin. In addition, CSCaCO<sub>3</sub>NP possesses structural porosity, a large surface area and functional group endings for electrostatic ion bonds with high loading capacity. Thus, it maintains great potential in the drug delivery system and a large number of biomedical utilisations. The pioneering researchers adopted a non-hazardous top-down method for the synthesis of CSCaCO<sub>3</sub>NP with subsequent improvements that led to the better spherical diameter size obtained recently which is suitable for drug delivery. The method is therefore a simple, low cost and environmentally friendly, which involves little procedural steps without stringent temperature management and expensive hazardous chemicals or any carbonation methods. This paper presents a review on a few different types of nanoparticles with emphasis on the versatile most recent advancements and achievements on the synthesis and developments of CSCaCO<sub>3</sub>NP aragonite with its applications as a nanocarrier for drug delivery in nanomedicine.

**Keyword:** Cockle shell; Calcium carbonate; Nanoparticles; Nanomedicine; Aragonite; Biocompatibility; Drug delivery