Preparation and characterization of Calcium phosphate nanorods using reverse microemulsion and hydrothermal processing routes

ABSTRACT

Brushite (BR) and hydroxyapatite (HA) nanoparticles were fabricated through reverse microemulsion and hydrothermal processing route, respectively. The processing routes influenced nucleation and crystal growth although both methods resulted in nanorods formation. The calcium-to-phosphate ratio was 1.67, similar to that of natural bone and teeth. X-ray diffraction patterns revealed that the nanorods possessed almost pure crystal phase with negligible second phase. The ratio of particle length-to-width of BR and HA were approximately 3 and 4, respectively. To mimic the natural bone, chitosan/brushite (CTS/BR) and chitosan/hydroxyapatite (CTS/HA) nanocomposite scaffolds were prepared through rapid freeze-drying technique. The compressive strength of CTS/BR and CTS/HA nanocomposite scaffolds was compared for the first time. The compression test revealed that both the nanocomposite scaffolds exhibited reasonably high compressive strength of approximately 7 MPa. This value falls in the high-end range of cancellous bone's compressive strength, with the compressive strength of CTS/HA 0.88 MPa more than CTS/BR.

Keyword: Calcium phosphate nanoparticles; Compressive strength; Crystal growth; Hydrothermal; Microemulsion