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Controllable Synthesis of Poly(acrylic Acid)-Stabilized Nano-Hydroxyapatite Suspension by an Ultrasound-assisted Precipitation Method

Dong Yan^a, Yuxin Lou^a, Yingchao Han^{a,*}, M. Nirmali Wickramaratne^b, Honglian Dai^a, Xinyu Wang^a

^a State Key Laboratory of Advanced Technology for Materials Synthesis and Processing, Biomedical Materials and Engineering Research Center of Hubei Province, Wuhan University of Technology, Wuhan 430070, PR China

^b Faculty of Applied Sciences, Sabaragamuwa University of Sri Lanka, 70140 Belihuloya, Sri Lanka

Corresponding author: Phone: +86-18986218516. Fax: +86-27-87880734. E-mail address: hanyingchao@whut.edu.cn (Y.C. Han).

Abstract: An improved precipitation method was developed to prepare stable nano-hydroxyapatite (HAP) suspension with the aid of steric effect of poly(acrylic acid) (PAA) and acoustic cavitation effect. The effects of reaction temperature and PAA concentration on the formation of nano-HAP suspension were studied. The rising temperature led to the transformation of spherical amorphous calcium phosphate (ACP) to needle-like nano-HAP crystals with the increase in size. The increasing PAA concentration mightily hindered the crystallization of HAP instead of decreasing the size. PAA provided steric effect to stabilize nano-HAP in solution due to the electrostatic interaction between $-\text{COO}^-$ of PAA and Ca^{2+} on the surface of HAP. The obtained PAA-stabilized nano-HAP suspension showed good stability in different media (water, PBS, RPMI 1640) and noncytotoxicity. This study provides a potential technology for the controllable synthesis of stable nano-HAP suspension.

Keywords: hydroxyapatite, nanoparticles, suspension, poly(acrylic acid), ultrasound, biomaterials.

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