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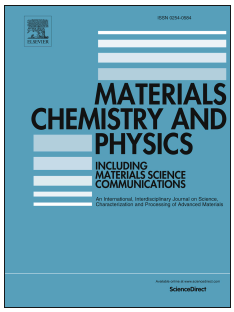

Controllable synthesis of spherical hydroxyapatite nanoparticles using inverse microemulsion method

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Controllable synthesis of spherical hydroxyapatite nanoparticles using inverse microemulsion method

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Abstract

Spherical nanosized hydroxyapatite (HA) was successfully synthesized via a water-in-oil microemulsion route at room temperature in short time. The effect of water-to-oil and water-to-surfactant ratios on the stability of microemulsion system was investigated to establish a stable reaction system, with span-80, cyclohexane and $Ca(NO_3)_2.4H_2O$($(NH_4)_2HPO_4$) solution as surfactant, oil phase, and water phase, respectively. Size and morphology change of obtained HA under optimal mircroemulsion system were further studied under various reaction time and temperature, and a possible growth mechanism was proposed. A moderate reaction temperature of 25 □ and reaction time of 5 hr facilitated the formation of spherical HA particles in the dimension of 70 nm with good uniformity and regularity, which served as a great candidate in biomedical applications.

1. Introduction

Hydroxyapatite($Ca_{10}(PO_4)_6(OH)_2$, HAp), as a main inorganic composition in bone tissue, has been widely used in various biomedical fields such as bone tissue engineering[1-3], drug delivery[4-7] and cell imaging[8, 9], due to its excellent biocompatibility, bioactivity and biodegradability. Among different hydroxyapatite structures, nano-sized ones have stimulated great interests for its outperforming characteristics compared to corresponding counterparts with larger dimension. Studies revealed that a series of unique properties of hydroxyapatite are closely related to the size[10, 11], shape[12], surface morphology and surface area[13]. For example, Tang[12] reported that nano-sized hydroxyapatite could exhibit unique anti-tumor ability. In other studies, Zhou[1] proposed that HAp with microstructure might lead to magnificent improvements in mechanical properties of resulting