

Abstract

Hydroxyapatite nanoparticles (HAP NPs), materials with an advanced flexible structure and a broad range of optimistic biological applications, can be used as a host material and can be modified with a variety of substrates and derivatives. Among them, rare earth ions used to substitute ions from HAP NPs structure, have received attention due to their unique physicochemical and imaging properties. Compared with other fluorescent probes, RE-doped HAP NPs display advantages in high brightness, high contrast, photostability, nonblinking, and narrow emission bands. At the same time, their intrinsic characteristics, such as composition, morphology, size, crystallinity, and luminescence intensity can be adjusted by changing the dopant ratio, temperature of synthesis, reaction time, and techniques. Hydroxyapatite nanoparticles have been used in various biomedical applications, including imaging probes, drug delivery, bone tissue regeneration and repair, and antibacterial research.

The aim of this thesis is to present the synthesis process of rare earth elements doped hydroxyapatite at different concentrations, with an increase in photoluminescent properties with dopant ion concentration, resulting in them being attractive candidates for advancement and use in biological system imaging. After evaluating the structural, morphological, and optical properties with cytotoxicity assessments and fluorescence behavior we have a prove that co-precipitation method can be used to obtain new doped hydroxyapatite using various concentrations of rare earth ions (until 1%), which can serve as promising nanomaterials for medical applications.