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THE HYDROXYAPATITE AND BETA- TRICALCIUM PHOSPHATE RATIO IN EUROPIUM-DOPED BIPHASIC CALCIUM PHOSPHATE CONTROLLED BY PH VALUE DURING THE COPRECIPIATION SYNTHESIS

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Calcium phosphates are chemical compounds of special interest in medicine, since they are the major inorganic component of all mammalian calcified tissues. The most widely used synthetic calcium phosphate-based bioceramics are hydroxyapatite [HA, $\text{Ca}_{10}(\text{PO}_4)_6(\text{OH})_2$] and beta-tricalcium phosphate [BTCP, $\text{Ca}_3(\text{PO}_4)_2$]. HA is stable in a body fluid, while BTCP is rather soluble. Obtain a fluorescent HA and BTCP nanoparticles offer the attractive possibilities for continuous and nondestructive bioimaging observations, which is helpful for monitoring the implanted subject and the delivering progression of drug carriers. In particular, HA and BTCP can be used as luminescent materials when activated by Eu^{3+} ions in substitution of Ca^{2+} ions. Herein, the Eu^{3+} ions doped HA and BTCP nanoparticles were synthesized by co-precipitation method. The phase composition were analyzed by X-ray diffraction (XRD) using a Multiflex Rigaku diffractometer, transmission electronic microscopy (JEM 2010 –JEOL) and scanning electron microscopy (FEG, JSM 6701F – JEOL). Fluorescence spectroscopy was carried out, at room temperature, in a Fluorolog 3 Fluorimeter from Jobin Yvon in order to investigate the fluorescence emission of the HA-Eu, BTCP-Eu and biphasic compounds. The as-synthesized nanopowders have shown only the hexagonal phase of HA, for all samples. After the thermal treatment at 1000°C , the XRD shows the HA, BTCP and HA/BTCP patterns depending on the pH of the synthesis. Eu-doped HA exhibited a red-orange emission at 575 nm with several minor peaks at 610–640 nm, while Eu-doped BTCP had an unexpected strong red emission at 610-620 nm and a secondary band at 590–600 nm, almost 20-fold higher than HA. This efficient fluorescence of BTCP could be useful for the imaging with biomaterials for therapeutic and diagnostic applications. The biphasic one shows a mixture of the spectra, and the more the BTCP phase, the higher the red emission at 610-620nm.