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Development of HAp/TiO2 Composites for the preparation of Piezoelectric Biomaterials

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Abstract

Bone is the second most implanted tissue only after blood, therefore the interest in developing new biomaterials that replace the functions of bone and cartilage are of great interest today. Hydroxyapatite, bioactive and piezoelectric ceramic, is the most common biomaterial used for bone tissue and it demonstrates that the incorporation of metallic oxides such as titanium oxide (TiO2), reflects an improvement in mechanical properties that it lacks by itself. On the other hand, properties such as pyroelectric, ferroelectricity and piezoelectricity of HAp have been a subject of great interest in the regeneration of bone tissue. In this work nanocomposite powders were obtained by co-precipitation and sol-gel methods assisted by ultrasonic radiation, using Ca (NO3)2• 4H2O and (NH4)2 HPO4 as precursors of HAp and TiOSO4• xH2O as precursor of TiO2. The Synchrotron X-ray (SXRD) and STXM measurements were used to determine the crystal structure, environmental composition and formation of the composite. The HAp/TiO2 composite was formed and showed a mixture of phases. PFM measurements of composite indicated a good agreement with effective piezoelectric constant. The composite obtained exhibits piezoelectrical and mechanicals properties that can be used in the manufacturing of scaffolds either as support in fractures or in conjunction with collagen for the regeneration of bone tissue.

About

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