

CHARACTERIZATION OF THE MATURATION PROCESS OF CARBONATE APATITES BY HRTEM

C.A.O. Ramirez¹, A.M. Costa¹, J. Bettini², A.J. Ramirez² and A.M. Rossi¹

¹Centro Brasileiro de Pesquisas Físicas, CBPF, Rio de Janeiro, RJ, Brasil

²Laboratório Nacional de Luz Síncrotron, LCLS, Campinas, SP, Brasil

Calcium phosphates present in calcified tissues are widely studied by different characterization techniques to obtain new information of the ultrastructural features. High-resolution transmission electron microscopy (HRTEM) has become a currently powerful method for this endeavor. The mineral phase of bones, enamel and dentin, is characterized as carbonated hydroxyapatite, $\text{Ca}_{10-x}(\text{PO}_4)_{6-x}(\text{CO}_3)_x(\text{OH})_{2-x}$, with $0 \leq x \leq 2$ (CHAp), with the presence of other element traces. Synthetic CHAp is known as an excellent model to understand the structural and chemical processes of its biological analogue. In spite of numerous studies, not yet have a clear idea of the complete crystallization process of these nanoparticles. Here, it was used HRTEM to characterized precipitated CHAp in the early stages of the ageing time, looking for precursor phases and a crystallization model. Initially, an amorphous calcium phosphate precursor transforms in a crystalline apatitic CHAp phase, confirmed by simulated images, electron diffraction and Fast Fourier Transformed images, revealing an evolution in the crystallization of the particles and it was found different crystallographic configurations apart of the core/shell model proposed in the literature. Combining with conventional results (XRD, FTIR), these analyses reinforced the importance of HRTEM to acquire new crystallographic information during the crystal growth process of this fundamental bioceramic.