Calcium phosphate has studied for its biological applications in bioceramics products, where most reports are focuses on hydroxyapatites derivates. Hydroxyapatite (Ca$_{10}$ (PO$_4$)$_6$ (OH)$_2$) is the main component of bones and teeth, which gives them a hardness characteristic, so it is vital its use as a biocompatible material for biomedical application in maxillofacial and veterinary surgery, dentistry and orthopedics. In multiple studies reported for calcium phosphate, these materials have not been studied structurally and their composition for each polymorph has not been determined. So, in this work, we studied the structural composition and the various polymorphs of hydroxyapatite derived from chicken bones, goat, rabbit, beef ribs, pork ribs and hydroxyapatites synthesized by two methods, the co-precipitation at low saturation method from H$_3$PO$_4$, H(NH$_4$)$_2$PO$_4$, Ca(NO$_3$)$_2$, Ca$_2$P$_4$O$_7$ and NH$_4$OH and by ultrasound assisted method from H$_3$PO$_4$, Ca(OH)$_2$ and the addition of simulated body fluid (SBF). Each material synthesized was characterized by X-ray Diffraction of Polycrystalline samples, X-ray fluorescence, FTIR, differential scanning calorimetry, thermogravimetry and scanning electron microscopy. From the characterization data the presence of multiple crystalline phases have been identified and the profiles Diffraction X-ray using the Rietveld method by to determine the percentage of each crystalline phase and level of structural occupancy of each element present has been analyzed. This work reports three new structures of calcium phosphate in the Cambridge Crystallographic Data Centre.

**Keywords:** Structural study by X Ray Powder Diffraction, hydroxyapatite, derived from edible animal bones

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