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Effect of processing temperature on the properties of Fe-Hydroxyapatite[1] VINDU KATHRIARACHCHI, THEODORA LEVENTOURI, Department of Physics, Florida Atlantic University, ADAM RONDINONE, Center for Nanophase Materials Sciences, Oak Ridge National Laboratory, KOREY SORGE, Department of Physics, Florida Atlantic University — Multi-substituted Hydroxyapatite (HAp), $Ca_5(PO_4)_3OH$, is the main mineral phase in physiological apatite. Fe is a minor substitution element in bone and enamel substituting Ca in the HAp structure. Crystal structure, magnetic and microstructure properties of $Ca_{5-x}Fe_x(PO_4)_3OH$ depend on processing parameters. We present results from our research on the $Ca_{5-x}Fe_x(PO_4)_3OH$ system (x = 0.0, 0.05, 0.1, 0.2 and 0.3) prepared at 37° C, and 80° C. Hydroxyapatite single-phase was detected for x <0.1 in both sets of samples, while hematite and/or maghemite develops starting at x = 0.1. Rietveld refinements of XRD and NPD patterns show that the a and c lattice constants decrease with increasing Fe concentration for both sets of samples. Pure HAp is diamagnetic but as x increases, Fe-HAp transitions from paramagnetic to weak ferromagnetic behavior. TEM images show spherical particles in samples prepared at 37° C, and elongated particles in samples prepared at 80° C. XRF studies confirm the iron substitution and show that the Ca/P stoichiometric ratio of 1.67 decreases with increasing the Fe concentration. Further, the Fe/Ca+Fe atomic ratios of samples prepared at 37° C are greater than those prepared at 80° C.

[1]TEM and XRF data were collected at the Center for Nanophase Materials Sciences which is a DOE Office of Science User Facility. NPD data were collected at the SNS of the ORNL.

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