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Fe incorporation into hydroxyapatite channels by Fe loading and post-annealing

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Abstract

Apatite-type solid solutions with the formula $\text{Ca}_{10}(\text{PO}_4)_6\text{Fe}_x\text{O}_y\text{H}_z$ containing Fe atoms in the channel sites of $\text{Ca}_{10}(\text{PO}_4)_6(\text{OH})_2$ were successfully synthesized by impregnation with aqueous solution of Fe, followed by heat treatment at 1150 °C in air and cooling to room temperature. The unit cell volume of $\text{Ca}_{10}(\text{PO}_4)_6\text{Fe}_x\text{O}_y\text{H}_z$ increased with increasing Fe content. The results of structural refinement using powder X-ray diffraction data and Raman spectroscopy suggested that the incorporated Fe ions occupied four-fold sites, away from the center of the channel in the apatite lattice. This method may be useful for synthesizing novel apatite-type functional materials containing transition metals.

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