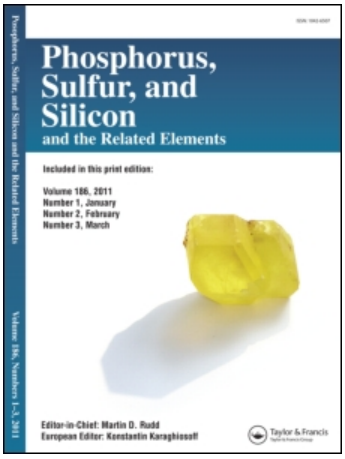

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Synergistic Effects of Fluorine and Carbonate on Cd^{2+}Binding Properties of Apatites

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Most of the studies on heavy metals binding ability of apatites have been carried out on hydroxyapatites (HAp)·$[Ca_{10}(PO_4)_6(OH)_2]$. As the chemical characteristics of apatite depend substantially on the substitutions in its structure, the apatites with F^- substitution for OH^- and CO_3^{2-} for PO_4^{3-} were studied.

The apatites used in the study were synthetic precipitated apatites as well as Estonian and Israel phosphorites. The mole ratio of CO_3/PO_4 and F/Ca in synthetic apatites varies in the range of 0.03-0.20 and 0-0.18, respectively. The removal characteristics of apatites for Cd^{2+} were examined in aqueous solutions with pH=6 by means of the batch method.

The binding capacity of Cd^{2+} ions rises with the increase in the F^- content in HAp up to F/Ca ratio 0.09 and decreases after that. The increase in CO_3^{2-} substitution in the apatite structure decreases its binding capacity. The maximum amount of Cd bound with FHAp was 2.6 mg per 100 mg Ap (Cd/Ca=0.024), with phosphorites 2.3 mg per 100 mg Ap (Cd/Ca= 0.02).

The mechanism of sorption depends on the nature of apatite. In the case of synthetic apatites the ion-exchange process dominates. However, with the increase of the carbonate content the adsorption mechanism becomes more important. The removal ability of natural apatites depends substantially on their surface area, proceeding mainly by ion exchange in the external surface layer. Anionic substitutions affect the binding capacity of apatites only a little, compared with Mg^{2+} substitutions [1].

References

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