Study on Crystal Phase Change Process of Two Line Ferrihydrite and Cadmium Adsorption Ability

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Two line ferrihydrite (2LFh) was synthesized in laboratory, the crystal phase changes of synthetic mineral during high temperature aging process affected by co-existing ions (Ca^{2+}、 Mg^{2+} and Cl^{-}) were studied. In addition, the Cd^{2+} adsorption effects of the products at different pH values and different Cd^{2+} concentrations were also studied through the experiments. The results showed that the existence of Ca^{2+} had no significant effect on the synthesis and aging of 2LFh. However, at the presence of Mg^{2+} and Cl^{-}, akaganeite could be found in the synthetic material, and with the increase of the ion concentration, the crystallinity of the formed akaganeite was marked. Akaganeite had a significant inhibitory effect on the aging of 2LFh, with more apparent effect on Cd^{2+} adsorption on aged 2LFh than on pure 2LFh. The adsorption and removal rates of Cd^{2+} in Fh2 series and Fh2-200 series increased with the increasing of initial concentration. With the increase of pH, the adsorption capacity and removal rate were increased, and the removal rate reached nearly 100% as pH value ranging from 10 to 11. The isothermal adsorption experiment showed that the isothermal adsorption process of Cd^{2+} in Fh2 series and Fh2-200 series were in accordance with Freundlich model. The affinity coefficients (Kf) of Freundlich model of Fh2-200 series arranged in descending order is Fh2-200-Mgs> Fh2-200-Cas> Fh2-200s, showing that the Cd^{2+} adsorption capacity of Fh2-200 was relatively weak, while that of Fh2-200-Ca series and Fh2-200-Mg series was relatively strong, which was confirmed by the experimental results.

[1] T. Hiemstra, Surface and mineral structure of ferrihydrite. Geochim. Cosmochim. Acta 2013, 105, 316.