Removal of arsenic from groundwater by Fe-Al binary oxide: kinetics, equilibrium and thermodynamic studies

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In this study, iron-aluminum binary oxide was synthesized and evaluated for arsenic removal. Arsenic adsorption capacity of iron oxide is significantly improved by combining aluminum oxide due to expansion of surface area. To discover the adsorption mechanism of As(V) and As(Ⅲ) on Fe-Al bimetallic oxide clearly, adsorption kinetic and thermodynamic parameters are determined. Adsorption temperature was varied from 289 to 333 K. Both As(V) and As(Ⅲ) adsorption on Fe-Al binary oxide are spontaneous reaction when their initial concentration is lower than 50 mg/L. Compared with As(Ⅲ), As(V) adsorption is more favorably occur. Both arsenic species adsorption was decreased with increase of temperature. It indicates that As(V) and As(Ⅲ) adsorption are exothermic process. In the kinetic experiment, adsorption of As(V) is much faster than that of As(Ⅲ). Increase of temperature lower the adsorption of As(V) just same as thermodynamic experiment. On the other hand, As(Ⅲ) adsorption became faster with temperature increase. It seems that As(Ⅲ) adsorption is not fast enough to ignore the effect of diffusion that is closely related to temperature.