Cr(VI) reduction/immoblization by magnetite functionalized sepiolite

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Magnetite is one of the major Fe(II)-bearing minerals, and the reduction of Cr(VI), Tc(VI), As(V), U(VI) by structural Fe(II) in magnetite via a coupled reduction-sorption mechanism has been investigated widely. However, because of its small surface area, easy aggregation, and the formation of a passivation layer on the surface by transformation of magnetite to geothite and maghematite, which would stop further reduction, the sorption and reduction effciencies of magnetite is low for high concentration pollutant. Sepiolite is a porous and fibrous hydrated magnesium silicate nanominerals and has been used to capture heavy metal ions from water environment, due to its high surface area (more than 200 m2/g), low cost, and ubiquitious occurrence. Herein, magnetite functionalized sepiolite was prepared by microwave assissted method. The magnetite nanoparticles loaded on the sepiolite surface were characterized by XRD, SEM, TEM and XPS techniques, respectively. The batch experiments about the reduction and immoblization of Cr (VI) reveal that magnetite modified sepiolite has good removal efficiency, and the reduction of Cr (VI) is affected by the weight ratio of magnetite to sepiolite in this composite. Cr ions are adsorbed through ion exchange or surface complexation. The composite of magnetite functionalized sepiolite strengthens the role of magnetite in redox rections of Cr (VI). Furthermore, the composite could be easily separated from solution due to its obvious magnetic property. As the oxidation state of Cr determines its toxcity, solubility, mobility and fate, and Cr (III) is much less mobile and lower toxic relative to chromate, the magnetite functionlized sepiolite composite would have vast potential applications in water environment treatment.