Performance of Iron Oxyhydroxide Nanoparticles in Lead Adsorption: A Comparison Study

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Abstract

Lepidocrocite (γ-FeOOH) and goethite (α-FeOOH) are two of the most common iron oxy-hydroxides in natural systems. Lepidocrocite and goethite were synthesized using iron (II) chloride tetra-hydrate and iron (III) nitrate nona-hydrate. The ultra sound waves were used to minimize the agglomeration of the nanoparticles. FTIR and SEM characterized the nanoparticles. The particles were needle-like in shape and their diameter was detected between 20-40 nm and 30-40 nm for lepidocrocite and goethite, respectively. The aim of this study was to investigate the adsorption potential of lepidocrocite (γ-FeOOH) and goethite (α-FeOOH) towards lead in aqueous solutions. The adsorption of lead was studied by batch experiments and the effects of different operational parameters e.g., type of adsorbant, solution pH, adsorbent dose, contact time, and the initial concentration of Pb in constant temperature (25°C) and agitation rate were studied. The concentration of Pb was measured by atomic absorption spectroscopy. Lepidocrocite exhibited > 53% and 38% adsorption from 50 and 5 mg/L Pb solutions, respectively. However, goethite demonstrated 100% adsorption in 5 and 50 mg/L Pb solutions. The adsorption increased in the following order: goethite < reach of goethite < reach of lepidocrocite < lepidocrocite.