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A Comparison of the Adsorption Mechanism of Arsenic on Iron-Modified Nanoclays

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Abstract : Arsenic adsorbents were continuously being researched to ease the detrimental impact of arsenic to human health. A comparative study on the adsorption mechanism of arsenic on iron modified nanoclays was undertaken. Iron intercalated montmorillonite (Fe-MMT) and montmorillonite supported zero-valent iron (ZVI-MMT) were the adsorbents investigated in this study. Fe-MMT was produced through ion-exchange by replacing the sodium intercalated ions in montmorillonite with iron (III) ions. The iron (III) in Fe-MMT was later reduced to zero valent iron producing ZVI-MMT. Adsorption study was performed by batch technique. Obtained data were fitted to intra-particle diffusion, pseudo-first order, and pseudo-second-order models and the Elovich equation to determine the kinetics of adsorption. The adsorption of arsenic on Fe-MMT followed the intra-particle diffusion model with intra-particle rate constant of 0.27 mg/g-min0.5. Arsenic was found to be chemically bound on ZVI-MMT as suggested by the pseudo-second order and Elovich equation. The derived pseudo-second order rate constant was 0.0027 g/mg-min with initial adsorption rate computed from the Elovich equation was 113 mg/g-min.

Keywords : adsorption mechanism, arsenic, montmorillonite, zero valent iron
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