

Mixed Alumina-Silicate Materials for Groundwater Remediation

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Abstract : The current work is investigating the effectiveness of combined mixed materials mainly modified bentonites and organoclay in treating contaminated groundwater. Sodium bentonite was manufactured with a quaternary amine surfactant, dimethyl ammonium chloride to produce organoclay (OC). Inorgano-organo bentonite (IOB) was produced by intercalating alkylbenzyl-dimethyl-ammonium chloride surfactant into sodium bentonite and pillared with chlorohydrate pillaring agent. The materials efficiency was tested for both TEX compounds from model-contaminated water and a mixture of organic contaminants found in groundwater samples collected from a contaminated site in the United Kingdom. The sorption data was fitted well to both Langmuir and Freundlich adsorption models reflecting the double sorption model where the correlation coefficient was greater than 0.89 for all materials. The mixed materials showed higher sorptive capacity than individual material with a preference order of X > E > T and a maximum sorptive capacity of 21.8 mg/g was reported for IOB-OC materials for o-xylene. The mixed materials showed at least two times higher affinity towards a mixture of organic contaminants in groundwater samples. Other experimental parameters such as pH and contact time were also investigated. The pseudo-second-order rate equation was able to provide the best description of adsorption kinetics.

Keywords : modified bentonite, groundwater, adsorption, contaminants

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