

Removal of fluoride from aqueous solutions by adsorption on alumina pillared montmorillonite

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High fluoride concentration in drinking and industrial water does serious harm to ecosystem and human beings. This paper used pillared clay (PILC) to adsorb fluoride in wastewater. PILCs are an interesting class of 2-dimensional microporous materials. Due to their high surface area and permanent porosity they are very attractive solids for adsorption purposes. PILC was prepared by a Na-montmorillonite exchanged with hydroxy-Al cations, which was synthesized by the hydrolysis of $\text{AlCl}_3 \cdot 6\text{H}_2\text{O}$ with NaOH, the degree of hydrolysis of OH/Al was 2.4, then thermally treated at 350°C to convert hydroxy-Al cations to Al_2O_3 pillars to generate permanent microporosity in the interlayer. PILC was characterized by X-ray diffraction (XRD), SEM, and specific surface area determination. PILC was contacted with fluoride aqueous solutions, at a concentration range between 4 and 20 mg/l, in batch equilibrium experiments, in order to determine their adsorption properties. Their suitable conditions and adsorption isotherms were studied. On the basis of these studies, the mechanism of fluoride removal was investigated. The results showed that PILC has many characteristics such as considerable adsorption capacity, stability of oxide pillar, low cost, etc., therefore, it is a potential substance of adsorption of environmental pollutants.