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Fabrication of layered Al-silicate magadiites for the removal of reactive dyes from textile effluents

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ABSTRACT

Layered silicate magadiites were synthesized with and without structurally incorporated aluminum in the inorganic framework and characterized by nitrogen adsorption, nuclear magnetic resonance spectroscopy, thermogravimetry, X-ray diffraction and scanning electron microscopy. The modified layered alumino-silicates [Al]NaMG and [2Al]NaMG showed higher adsorption capacities for remazol yellow dye (RY), about 0.026 and 0.028 mmol g^{-1}, respectively, when compared with the original silicate analogues (0.014 mmol g^{-1}). Dyes adsorption isotherms are dependent on pH, contact time, concentration and adsorbent. The adsorption kinetics of RY dye was slow and the equilibrium reached in 3 to 4 h. The pH effect on adsorption process was investigated at room temperature. Kinetic data of RY adsorption onto magadiites were best fitted to pseudo-first-order kinetic model. The equilibrium data were fitted to the Langmuir, Freundlich and Sips isotherm models. The Sips model best fitted to the adsorption data. The obtained results suggest that aluminum incorporated layered silicates could be efficient and cheap materials for the removal of reactive dyes such a RY from textile effluents.

Keywords: Magadiite; Aluminum; Dye removal; Remazol yellow; Adsorption

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