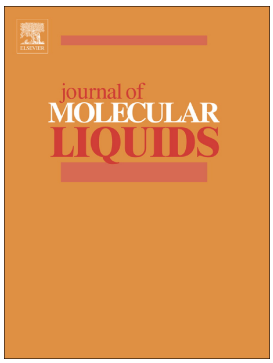

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Removal of crystal violet and methylene blue from aqueous solutions using the fly ash-based adsorbent material-supported zero-valent iron

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Abstract: A novel granular adsorbent material containing zero-valent iron (ZVI-GAM) was prepared with fly ash as skeletal material, bentonite as binder and *Enteromorpha prolifera* as pore former. ZVI was synthesized by direct reduction of iron ore tailings powder with the coke as reductant in high temperature reducing atmosphere and embedded in the fly ash-based porous adsorbent, which could reduce the agglomeration and oxidation of ZVI. The structure of ZVI-GAM was characterized by SEM, EDX, XRD, FTIR and BET. The removal amount of crystal violet (CV) and methylene blue (MB) was evaluated at different contact time, initial dye concentration, pH values and temperature. The adsorption isotherms of CV and MB fitted well to the Langmuir model. The maximum removal capacity of ZVI-GAM for CV and MB was found to be 172.41 mg/g and 151.52 mg/g, respectively. The adsorption processes of CV and MB could be described by a pseudo-second-order kinetic model. The reduction kinetics of CV by ZVI-GAM fitted to pseudo-first-order kinetics model. The results indicated that chemisorption and reduction controlled the removal process of CV while chemisorption only controlled the removal process of MB. The thermodynamic study indicated that the adsorption processes of CV and MB were found to be endothermic and spontaneous. Therefore, ZVI-GAM was an effective, low-cost and recyclable material for dye removal.

Keywords： Granular adsorbent material Zero-valent iron Crystal violet Methylene blue Adsorption Reduction

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