



Nanoporous calcined MCM-41 silica for adsorption and removal of Victoria blue dye from different natural water samples

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ABSTRACT

In this work, nanoporous MCM-41 silicate was used for the Victoria blue adsorption and removal from the aqueous solutions. The properties of the synthesized MCM-41 were determined by X-ray diffraction analysis, transmission electron microscopy, and TGA analysis. The method is based on the adsorption of Victoria blue after passing on MCM-41 in a column. The adsorption with respect to contact time, pH, flow rate of sample, and initial concentration of analyte was investigated to provide more information about the adsorption characteristics of MCM-41. After adsorption of the dye, the concentrations of residual dye were determined by UV–Vis spectrophotometer. Adsorption process is well described by Langmuir and Temkin isotherms in comparison with Freundlich isotherm. Results suggested that the adsorption of Victoria blue on calcined MCM-41 was a spontaneous and endothermic process. The experimental data fitted very well with the pseudo-second-order kinetic model for Victoria blue onto calcined MCM-41. Adsorption capacity was found to be 192.3 mg g⁻¹. The method was applied to the adsorption and removal of Victoria blue in different environmental water samples.

Keywords: Nanoporous MCM-41; Adsorption; Victoria blue dye; Kinetic; Equilibrium; Removal

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