Adsorptive removal of acid orange 7 from aqueous solution with metal–organic framework material, iron (III) trimesate

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ABSTRACT

In this paper, a highly porous metal–organic framework (MOF) based on iron (III) trimesate (MIL-100 (Fe)) was applied to the adsorption of a harmful anionic dye, acid orange 7 (AO7), from aqueous solution. The influences of various factors on the adsorption as well as adsorption kinetics and isotherms were investigated. It was found that a relatively low pH value was favorable for the adsorption. The high dosage of the adsorbent led to a high decolorization rate, but a low adsorption quantity. The adsorption kinetics obeyed the pseudo-second-order kinetic model and the adsorption isotherms followed the Langmuir mode. The driving force of the adsorption was an entropy effect rather than an enthalpy change. The adsorption mechanism may be explained with a simple electrostatic interaction between AO7 aqueous solution and the adsorbent. The adsorption capacities of MIL-100 (Fe) are much higher than those of an activated carbon. Finally, it can be suggested that (MOFs) having high porosity and large pore size can be potential adsorbents to remove harmful AO7 in contaminated water.

Keywords: Metal–organic framework; Dye; Adsorption; Acid orange 7; Wastewater treatment

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