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Adsorption removal of Reactive Yellow 145 dye from aqueous solution using novel nZVI/(Fe–Mn) binary oxide/bentonite nanocomposite

Pham Van Lam, Nguyen Binh Duong, Phan Thi Ngoc Bich, Quan Thi Thu Trang*

Institute of Chemistry - Vietnam Academy of Sciences and Technology (VAST), 18 Hoang Quoc Viet Str. Hanoi, Vietnam, email: Quanthutrang5986@gmail.com (Q.T. Thu Trang), phamvanlam@ich.vast.vn (P.V. Lam), duongnguyentb1992@gmail.com (N.B. Duong), bich@ich.vast.vn (P.T.N. Bich)

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ABSTRACT

A novel nanocomposite adsorbent of nZVI/(Fe–Mn) binary oxide/bentonite (IFMB) was developed in our study. In this paper, the adsorption behaviour of Reactive Yellow 145 (RY-145) dye from aqueous solution of IFMB was presented. The batch experimental results indicated that contact time, initial dye concentration and especially the initial pH value of the solution play important roles in the adsorption process of RY-145 onto IFMB. The adsorption efficiency was high and relatively stable in the range of pH < 7.0, when increasing the pH from 7.0 to 10.0, the adsorption efficiency decreased rapidly and at pH 11.0 there is almost not adsorption. The pseudo-second-order kinetics model was suitable for describing the adsorption kinetic data. The adsorption isotherm data was agreed well with the Langmuir model and the maximum adsorption capacity was as high as 338.9 $mg \cdot g^{-1}$ at 30°C. In addition, IFMB could be easily regenerated by alkaline elution, and the adsorption efficiency after the fifth adsorption–desorption cycle was 74.5% of the one after the first adsorption–desorption cycle. These results suggested that IFMB is a promising candidate for azo dye wastewater treatment.

Keywords: nZVI/(Fe–Mn) binary oxide/bentonite; Novel nanocomposite; Reactive Yellow 145; Adsorption; Azo dyes

* Corresponding author.

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