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Assessment, characterization, and separation of Alizarin red dye from aqueous solution using M-Fe layered double hydroxide

Hossam F. Nassar[a,*], Hussein M. Ahmed[b], Mariam E. Fawzy[c]

[a]*Environmental Science and Industrial Development Department, Faculty of Postgraduate Studies for Advanced Sciences, Beni-Suef University, 62511 Beni-Suef, Egypt, email: hossamnassarnrc@gmail.com*
[b]*Housing and Building Research Center (HBRC), Sanitary and Environmental Engineering Institute (SEI), Egypt, email: hussein_fee@yahoo.com*
[c]*Water Pollution Research Department, National Research Centre, P.O. Box: 12622, Dokki, Giza, Egypt, email: mariamemadeldin@hotmail.com*

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ABSTRACT

Recently, layered double hydroxides (LDH) have been applied intensively and attracted tremendous attention due to their flexible chemical composition and physical properties. In this study, we prepared a series of M (Mg and Zn)-Fe LDH at different conditions using the co-precipitation method. The influence of several important parameters was studied including M (Mg and Zn):Fe molar ratio, M-Fe LDH concentration, and pH. In this work, the potentialities of both synthesized adsorbents of M (Mg and Zn)-Fe LDH for the separation of cationic Alizarin red dye (ARD) from aqueous solutions were studied. The obtained results investigated that the maximum separation efficiency of 20 mg/L ARD was achieved at the molar ratio (4:1) of both adsorbents M (Mg and Zn):Fe at pH 6.0 and room temperature. Both pseudo-second-order kinetic models of Langmuir and Freundlich were successfully applied for the adsorption of ARD on both M (Mg and Zn)-Fe LDH adsorbents. By comparing the q_m values for both adsorbents, we obtained that Mg-Fe LDH had a significantly higher adsorption capacity of 72.4 mg/g than that obtained from Zn-Fe LDH of 33.8 mg/g. These results indicated that Mg-Fe LDH has better adsorption efficiency than Zn-Fe LDH for ARD.

Keywords: M-Fe layered double hydroxides (LDH); Separation; Alizarin red dye; Pseudo-second-order kinetic models

* Corresponding author.