22nd Iranian Chemistry Conference, 23-25 August, 2023
University of Kurdistan

Adsorptive removal of Rhodamin B from aqueous solution by a zirconium fumarate metal-organic framework (MOF-801)

Saeideh Eslaminejad,[a] Rahmatollah Rahimi[b]* and Maryam Fayazi[c]

[a] *Department of inorganic chemistry, Faculty of Chemistry, Iran University of Science and Technology, Tehran, Iran*

[b] *Department of Inorganic Chemistry, Faculty of Chemistry, Iran University of Science and Technology, Tehran, Iran*

[c] *Department of Environment, Institute of Science and High Technology and Environmental Sciences, Graduate University of Advanced Technology, Kerman, Iran*

[*] *E-mail: rahimi_rah@iust.ac.ir*

Various pollutants such as dyes following the arrival to ecosystems lead to serious global environmental pollution. Due to global strict regulations, it is obligatory to treat the wastewaters before being discharged into the environment [1]. One of the common, reliable and useful techniques employed for removal of synthetic dyes from industrial effluents is an adsorption process [2].

In this study, zirconium-fumarate metal-organic framework (MOF-801) was synthesized using solvothermal method [3]. The synthesized MOF-801 was characterized by XRD, SEM, IR, TGA, and BET techniques. XRD result was shown highly crystalline nature of the MOF-801. BET surface area analysis verified highly porous nature of the MOF-801. morphology of the obtained MOF-801 was examined by the scanning electron microscope (SEM). The SEM images were shown octahedral structure, the average diameter of which is about 300 nm. Pollutant adsorption tests were conducted over Rhodamin B (RhB) dye as an organic pollutant. The maximum equilibrium adsorption capacity was 19.1 mg g^{-1} with RhB dye having an initial concentration of 30 mg L^{-1}. Langmuir isotherm model was the best fit for adsorption data based on linear regression analysis. The best kinetic model for the adsorption was pseudo-second-order kinetics (R^2 = 0.9981). The effect of dye concentration, contact time and MOF dose on the adsorption of dye was also investigated. The study showed that MOF-801 is an efficient adsorbent for the removal of RhB dye from aqueous solution. Therefore, MOF-801 could be regarded as a promising adsorbent for the removal of dye pollutants due to its high adsorbent activity, good reusability, and easy preparation. MOF-801 can be reused at least five times.

Keywords: MOF-801, solvothermal, Absorption, Rhodamin B.

References

[1] M. Fayazi, D. Afzali, R. Ghanei-Motlagh, and A. Iraji, *Environmental Science and Pollution Research*, **2019**, 26, 18893-18903.
[2] M.Yang, and Q. Bai, *Colloids and Surfaces A: Physicochemical and Engineering Aspects*, **2019**, 582, 123795.
[3] G. Wißmann, A. Schaate, , S. Lilienthal, I. Bremer, A. M. Schneider, and P. Behrens, *Microporous and Mesoporous Materials*, **2012** 152, 64-70.