Environmental Engineering and Management Journal xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
http://www.eemj.icpm.tuiasi.ro/; http://www.eemj.eu

"Gheorghe Asachi" Technical University of Iasi, Romania

MAGNETIC POLYACRYLAMIDE HYDROGEL WITH TONER AND CHITOSAN FOR ADSORPTION OF AMIDO BLACK 10B

Qiaoyue Chen, Bingchen Zeng, Haoling Yan, Jianjun Wang, Chengli Yang, Yihui Zhu, Ziqian Chen, Guanya He, Kaishun Hu, Kaixuan Liu, Dali Li*, Ruofu Shi

Department of Bioengineering, School of Environmental & Biological Engineering, Nanjing University of Science & Technology, Nanjing, China

Abstract

The waste toner in the printer poses a serious threat to the environment and human health. That is necessary to recycle toner reasonably and effectively. In this study, toner powder was mixed with acrylamide and chitosan to prepare a magnetic hydrogel adsorbent which was further used to explore the adsorption of amido black 10B dye solution. The adsorbent was characterized by SEM, FTIR, VSM and TG. The zero charge point (pH_{pzc}) of the adsorbent was about pH 6, and the adsorption effect was better under acidic conditions. When the initial concentration of the dye solution was 200 mg/L, it reached equilibrium in about 4 h and the maximum adsorption capacity was 6.027 mg/g. When the initial concentration was 400 mg/L, it could be regarded as basic equilibrium in 6 h and the adsorption capacity was 11.106 mg/g at this time. The adsorption process well followed the pseudo-second-order kinetic model and Freundlich adsorption isotherm. The values of ΔH^{θ} and ΔG^{θ} indicated that the adsorption process was endothermic and spontaneous at high temperature.

Key words: adsorption, amido black 10B, chitosan, polyacrylamide, toner

Received: March, 2023; Revised final: September, 2024; Accepted: November, 2024

* Author to whom all correspondence should be addressed: e-mail: lidali@njust.edu.cn; Phone: +86-025-84315173