STYRENE-DIVINYLBENZENE COPOLYMERS FUNCTIONALIZED WITH GLYCINE GROUPS AND IMPREGNATED WITH Zn(II) FOR THE PHOTOCATALYSIS OF CONGO RED DYE

Laura Cocheci[1], Aurelia Visa[2], Bianca Marenescu[3]. Lavinia Lupa[1], Ecaterina Stela Dragan[4], Adriana Popa[2*]

[1] Politehnica University Timisoara, Faculty of Industrial Chemistry and Environmental Engineering, 6 Vasile Parvan Blvd., 300223, Timisoara, Romania
[2] "Coriolan Drăgulescu" Institute of Chemistry, 24 Mihai Viteazul Blvd., 300223, Timisoara, Romania,
[3] Faculty of Chemistry, Biology, Geography, 16 Pestalozzi Str., 300115 Timisoara, Romania
[4] Petru Poni Institute of Macromolecular Chemistry, 41A Aleea G. Gh Voda, Iasi, Romania
[*]e-mail: apopa_ro@yahoo.com; apopa@acad-icht.tm.edu.ro

Abstract

The ecotoxicological impact of dyes can be mitigated by textile wastewater pollution control, making sure that the issue of wastewater discharge directly into the environment is resolved.
In this work, water contaminated with Congo red dye was decontaminated using two new compounds of the glycine type pendant groups grafted on S-DVB copolymer.
A potential class of adsorbents are polymeric ones because they can form a large variety of porous shapes inside a particular chemical system. Enhancing the surface chemistry of polymer supports to get superior adsorption capabilities against certain contaminants is a commonly employed method that involves chemically altering polymer matrices with pendant functional groups [1]. Considerable attention has been paid to polymeric matrices with pendant functional groups as matrices for heterogeneous photocatalyst design [2]. A serious ecological issue has arisen in recent years as a result of the industrial sector's use of a wider range of artificial dyes that are harmful to the environment [3, 4].
In the present study, two novel compounds of glycine type pendant groups grafted on S-DVB copolymer were used for the decontamination of Congo red dye polluted water. They were characterized by FTIR spectroscopy, scanning electron microscopy, EDX spectroscopy, thermogravimetric analysis. Photocatalysis was used in the photodegradation process for both polymer-supported glycine groups (Code: AP2) and polymer-supported glycine-Zn(II) (Code: AP2-Zn(II)). The efficiencies obtained after 30 min of dark adsorption were 8.17% in the case of AP2 material, and 17.5% in the case of AP2-Zn(II) material, respectively. By using 25 mg/L initial concentration of Congo red dye and a catalyst concentration of 1 g/L and 240 min of irradiation, a photocatalysis efficiency of 86.7% in the case of glycine pendant groups grafted on styrene-6.7% divinylbenzene copolymer (AP2), and of 80.7% in the case of glycine-Zn(II) pendant groups grafted on styrene-6.7% divinylbenzene copolymer (AP2-Zn(II)), respectively, was achieved.

Acknowledgements

This work was partially supported by Program 2 of Romanian Academy, "Coriolan Dragulescu" Institute of Chemistry and by a grant of the Ministry of Research, Innovation and Digitization, CNCS - UEFISCDI, project number PN-III-P4-PCE-2021-0089, within PNCDI III.

References

[1] A. Popa, L. Cocheci, , L. Lupa, A. Pop, A. Visa, Appl. Sci. 13 (2023) 2025.

[2] Y. Orooji, R. Akbari, Z. Nezafat, M. Nasrollahzadeh, T.A. Kamali, J. Mol. Liq. 329 (2021) 115583.
[3] I.A. Salem, H.A. El-ghamry, M.A. El-ghobashy, J. Basic Appl. Sci. 3 (2014) 186.
[4] E.R. Shilpa, V. Gayathri, J. Saudi Chem. Soc., 22(6) (2018) 678.