proceedings

Abstract

Using Activated Carbon Adsorbents Obtained from Plastic Wastes from the Tunisian Beverage Industry †

Asma Nouira [1,2,3,*], Imene Bekri Abbes [2], Isabel Pestana Paixão Cansado [4], Paulo Mira Mourão [4] and José Eduardo Castanheiro [4]

[1] Faculty of Mathematical, Physical and Natural Sciences of Tunis, University of Tunis El Manar, Campus Universitaire, El Manar-Tunis 2092, Tunisia
[2] National Center for Research in Materials Science, Borj Cedria, Technopole of Borj Cedria, Slimane 8027, Tunisia; bekrimene@gmail.com
[3] Polo da Mitra da Universidade de Évora, 7000-083 Nossa Senhora da Tourega, Portugal
[4] Mediterranean Institute for Agriculture, Environment and Development & Change–Global Change and Sustainability Institute, Chemistry and Biochemistry Department, School of Science and Tecnhologies, University of Évora, Rua Romão Ramalho nº 59, 7000-671 Évora, Portugal; ippc@uevora.pt (I.P.P.C.); pamm@uevora.pt (P.M.M.); jefc@uevora.pt (J.E.C.)
* Correspondence: asma.nouira@fst.utm.tn
† Presented at the 3rd International Electronic Conference on Processes—Green and Sustainable Process Engineering and Process Systems Engineering (ECP 2024), 29–31 May 2024; Available online: https://sciforum.net/event/ECP2024.

Keywords: activated; carbon; bottle; waste; sulfamethoxazole; trimethoprim; adsorption

In this study, we investigated the preparation of char and activated carbon (AC) materials derived from water bottles and bottle waste collected at a waste collection point in Tunisia. The materials were synthesized using a rotary horizontal tubular furnace on a lab/pilot scale and through chemical activation. Characterization of the carbon materials was performed using nitrogen adsorption isotherms at 77K and SEM-EDX analysis.

Furthermore, we examined the effectiveness of the ACs in removing the antibiotics 4-amino-N-(5-methyl-1,2-oxazol-3-yl)benzenesulfonamide (sulfamethoxazole-$C_{10}H_{11}N_3O_3S$) and 5-(3,4,5-trimethoxybenzyl)pyrimidine-2,4-diamine (trimethoprim) from aqueous solutions. The results revealed a maximum adsorption capacity of 108.17 mg g^{-1} (85.34%) for sulfamethoxazole and 98.11 mg g^{-1} (89.73%) for trimethoprim on the PET-KOH-1:1-800°C sample.

Additionally, we analyzed the adsorption kinetics, fitting the data to pseudo-first and -second-order models, and studied the equilibrium isotherms using the Langmuir and Freundlich equation models. These findings suggest significant potential for the application of ACs derived from plastic bottle waste in the treatment of wastewater containing antibiotics.

Overall, our study highlights the feasibility of utilizing waste materials for the synthesis of valuable carbon-based adsorbents with promising adsorption capabilities. This research contributes to the ongoing efforts towards sustainable waste management and environmental remediation.

Supplementary Materials: The following supporting information can be downloaded at: www.mdpi.com/xxx/s1, Conference Poster: Using activated carbon adsorbents obtained from plastic wastes from the Tunisian beverage industry.

Author Contributions:. Conceptualization, I.P.P.C. and A.N.; methodology, I..P.P.C., I.B.A. and A.N.;. software, J.E.F.C..; validation, I.P.P.C., and P.A.M:M.; formal analysis, I.P.P.C., P.A.M:M. and A.N.; investigation, A.N. and I.P:P.C.; resources, I.B.A., A.N. and

Citation: Nouira, A.; Abbes, I.B.; Cansado, I.P.P.; Mourão, P.M.; Castanheiro, J.E. Using Activated Carbon Adsorbents Obtained from Plastic Wastes from the Tunisian Beverage Industry. *Proceedings* **2024**, *105*, x. https://doi.org/10.3390/xxxxx

Academic Editor(s): Name

Published: date

J.E.F.C.; data curation, A.N. and I.P.P.C.; writing—original draft preparation, A.N.; writing—review and editing, J.E.F.C. and P.A.M.M.; visualization, i.P.P.C.; supervision, I.P.P.C.; project administration, A.N. and I.B.A.; funding acquisition, A.N. and I.B.A. All authors have read and agreed to the published version of the manuscript."

Funding:. **Not applicable**

Institutional Review Board Statement:. Not applicable

Informed Consent Statement:. Not applicable

Data Availability Statement:. Not applicable

Conflicts of Interest:. The authors declare no conflict of interest.