proceedings

Abstract

Preliminary Assessment for Heavy Metal Removal from Synthetic Water Matrix Using an Organic/Inorganic Composite †

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† Presented at the 19th International Symposium "Priorities of Chemistry for a Sustainable Development", Bucharest, Romania, 11–13 October 2023.

Abstract: Pointed and diffused discharges of various compounds in the various compartments of the environment can end up disturbing ecosystems through rivers, lakes, groundwater and oceans, thus leading to a strong imbalance. The present paper describes a new and innovative composite material, based on organic and inorganic phases (pectin and hydroxyapatite), used as an adsorbent of heavy metals (Cd and Pb) from waters.

Keywords: composite material; pectin; hydroxyapatite; waters; heavy metals

Citation: Matei, R.I.; Baroi, A.M.; Fierascu, R.C.; Fistos, T.; Chican, I.E.; Ivan, G.; Hosu, I.S.; Nicolae, C.A.; Fierascu, I. Preliminary Assessment for Heavy Metal Removal from Synthetic Water Matrix Using an Organic/Inorganic Composite. *Proceedings* **2023**, *90*, 20. https://doi.org/10.3390/proceedings2023090020

Academic Editors: Mihaela Doni and Florin Oancea

Published: 8 December 2023

1. Introduction

Environmental pollution represents an important threat to natural ecosystems and human health but also a challenge to the scientific world. Many materials and technologies for water decontamination have been developed, but each type of process has its own characteristics, with the process parameters varying depending on the nature of the pollutant, the water flow and the concentration in which the target pollutant is found.

2. Materials and Methods

Phosphatic materials such as hydroxyapatite are considered to be among the most promising adsorbent phases due to their low production costs and possible recovery from circular economy sources. They are excellent adsorbents due to their high surface area, ease of functionalization and high affinity to various pollutants. Natural recovered polymers (e.g., pectin, chitin, alginate), due to their superior structural characteristics, availability, non-toxicity and ease of modification, can be used in the removal of organic and inorganic pollutants.

3. Results

The main characteristics of the proposed materials demonstrated through different batch tests are as follows: high adsorption capacity for heavy metals; high stability, allowing for several adsorption–desorption cycles; easy to integrate into an adsorption technology; easy to regenerate.

4. Conclusions

Considering both the need to prevent the generation of waste by the wine industry and environmental applications, by applying the composites obtained as adsorbents in water depollution, grape pomace and other such waste products represent an attractive raw material for obtaining different compounds of interest with a good cost–effectiveness ratio.

Author Contributions: Conceptualization, R.C.F. and I.F.; methodology, I.F., R.C.F. and I.E.C.; formal analysis, I.F., R.C.F., C.A.N. and G.I.; investigation, R.I.M., A.M.B., I.S.H. and T.F.; writing—original draft preparation, R.I.M., I.F. and R.C.F.; writing—review and editing, R.C.F.; supervision, R.C.F.; project administration, R.C.F. and I.F. All authors have read and agreed to the published version of the manuscript.

Funding: This work was funded by the PN 23.06 Core Program—ChemNewDeal within the National Plan for Research, Development and Innovation 2022–2027, developed with the support of Ministry of Research, Innovation, and Digitization, project no. PN 23.06.01.01 (AquaMat), and by the Ministry of Research, Innovation and Digitization through Program 1—Development of the national research-development system, Subprogram 1.2, Institutional Performance Projects to Finance Excellence in RDI, Contract no. 15PFE/2021.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The supporting data are available from the corresponding author.

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