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ÁREA: Síntese e caracterização de catalisadores e adsorventes.

Adsorção do herbicida glifosato utilizando bioadsorvente magnético

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Resumo-Abstract

The contamination of effluents by herbicides has become an increasing problem in society, especially due to modern agriculture's reliance on pesticides and chemical fertilizers. Glyphosate is a widely used herbicide, chemically classified as non-selective, systemic, and post-emergent, and it is highly effective in eliminating weeds in crops such as rice, soybeans, sugarcane, and coffee [1]. In this context, the removal of this pollutant from wastewater is crucial to minimize its environmental and human health impacts. In this work, the removal of glyphosate from liquid effluents was investigated using magnetic adsorbents derived from biomass. The magnetic adsorbents were prepared via the Pechini method, using $FeCl_3$, ethylene glycol, citric acid, and 10% biomass [2]. The material, called FCT01, was characterized by thermal analysis (TG/DTG and DTA), X-ray diffraction (XRD), Fourier-transform infrared spectroscopy (FTIR), and scanning electron microscopy (SEM). After characterization, glyphosate removal tests were carried out in a simulated environment, varying the pH (3, 7, and 10). The TG/DTG of the sample presented different mass loss stages, associated with processes such as water evaporation, resin and biomass component decomposition, and consequent oxide formation. The X-ray diffraction pattern of the sample showed characteristic peaks of magnetite (Fe_3O_4, PDF# 01-086-1362), a magnetic phase with an inverse spinel structure, where iron ions are distributed in tetrahedral and octahedral sites, as also identified by FTIR. The determination of the pH at the point of zero charge indicated that the adsorbent surface is neutral at pH = 7.0. Adsorption studies at different pH levels showed that glyphosate adsorption is most efficient at pH = 3.0, where the adsorbent surface is predominantly positively charged ($pH < pH_{pzc}$), achieving 70% removal. At pH = 7, where the adsorbent surface is approximately neutral or contains an equal number of positive and negative charges, glyphosate removal drops to 20%. At basic pH (10), the adsorbent surface is predominantly anionic ($pH > pH_{pzc}$), and glyphosate is also in its deprotonated form, resulting in a low adsorption capacity of only 10%. This variation in efficiency according to pH must be considered in the glyphosate removal process from aqueous systems. Overall, the results indicate that the adsorbents under study have the potential to be used as an efficient and cost-effective alternative for glyphosate adsorption from aqueous matrices.

Keywords: materials magnetic, glyphosate, adsorption

Referências

[1] Chen, Q. et al. Insights into the glyphosate adsorption behavior and mechanism by a $MnFe_2O_4$ cellulose activated carbon magnetic hybrid. V. 11, Ed 17, 2019. ACS Applied Materials & Interfaces.

[2] Lima, G, L. Desenvolvimento e aplicação de bio-adsorventes e catalisadores magnéticos derivados de resíduo de biomassa. Tese de doutorado. Universidade Federal da Bahia, 2018.

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