

Transforming shrub waste into a high-efficiency adsorbent: Application of *Physalis peruviana* chalice treated with strong acid to remove the 2,4-dichlorophenoxyacetic acid herbicide

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Abstract

In this study, the chalice generated from the production of the *Physalis peruviana* fruit was subjected to a treatment with sulfuric acid and applied in the adsorption of 2,4-Dichlorophenoxyacetic acid (2,4-D). The precursor, and the treated material before and after the adsorption, were analyzed by different techniques. After the acid treatment, it was found that the surface was changed from a smooth to an irregular surface with the presence of cavities with irregular size. The adsorption was favored at pH = 2 and with a dosage of 0.8 g L⁻¹. The pseudo-second-order model was the best to represent kinetic data. The isothermal experiments were well represented by the Langmuir and Tóth models, reaching a high capacity of 244 and 320 mg g⁻¹, respectively. The computed thermodynamic values show that the 2,4-D adsorption was spontaneous and exothermic. Overall, this study indicates that the *Physalis peruviana* chalice treated with strong acid presents great potential as an alternative material for the adsorption/removal of 2,4-D herbicide from liquid effluents.

Keywords

2,4-D; Herbicide; *Physalis peruviana*; Adsorption; Thermodynamic