Aerogels of Chitosan Doped with Biochar: Effective Strategy for Heavy Metal Adsorption in Wastewater Treatment

The pretreatment of wastewater before discharge into public access systems is necessary due to the environmental impact caused by substances such as heavy metals, highlighting chromium, cadmium, and lead due to their high toxicity. To address this issue, a viable solution based on the adsorption of heavy metals using chitosan aerogels doped with biochar at different concentrations is presented. This material is synthesized using the sol-gel technique and doping by impregnation. Additionally, various characterization techniques are employed on the aerogels, including infrared spectroscopy (IR), thermogravimetric analysis (TGA), differential scanning calorimetry (DSC), and scanning electron microscopy (SEM), aiming to determine the optimal conditions that ensure the desired properties of these materials. The obtained information is complemented by a kinetic study using adsorption isotherms to analyze the efficiency of the material's adsorption capacity, employing heavy metals as the adsorbate. This approach implements an innovative and environmentally friendly material while also adhering to the principles of the circular economy by utilizing waste plant material as a raw material.

Key words:

Sol-gel technique

Heavy metal adsorption

Chitosan aerogels

Biochar doping

Circular economy