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MAGNETICALLY MODIFIED SUGARCANE BAGASSE DISORDERED CARBON AS A CADMIUM REMOVAL AGENT IN WATER

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Abstract

Heavy metals are hazardous to health at certain levels. Currently, heavy metals are removed by physicochemical treatments, such as adsorption, flotation, and electrochemical deposition, and also biological treatments, such as algal biofilm reactor and anaerobic ammonium oxidation. In this study, magnetic biochar was produced to enhance the effectiveness and performance of the adsorbent for heavy metal removal . This study aimed to synthesise high-performance magnetic biochar , to determine the optimum parameters and conditions for high yield of magnetic biochar and high removal of cadmium (Cd2+) from aqueous solution, and to determine the adsorption kinetics and isotherms for Cd^{2+} removal . Nickel oxide (NiO)-impregnated sugarcane bagasse was subjected to slow pyrolysis to produce magnetic biochar . The impregnated metal, pyrolysis temperature, and pyrolysis time were varied to determine the optimum parameters and conditions to produce high-performance magnetic biochar . The removal of Cd^{2+} from aqueous solution and batch adsorption study were conducted. The synthesised magnetic biochar was characterised using field-emission scanning electron microscopy (FESEM), energy dispersive X-ray (EDX), X-ray diffraction (XRD), Brunauer-Emmett-Teller (BET) surface area, Fourier transform infrared (FTIR), and vibrating sample magnetometer (VSM). The adsorption data agreed well with the pseudo-second-order model and followed the Langmuir isotherm model. This study achieved 88.47% removal efficiency of Cd^{2+} from aqueous solution. Thus, the removal of this heavy metal as a human carcinogen reduces the hazardous effects on human health and reduces the toxicity in the environment.

Author keywords

Biomass; Heavy metal removal ; Magnetic biochar

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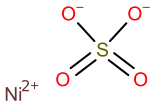

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