

Adsorption of Caffeine and Ciprofloxacin onto Pyrolytically Derived Water Hyacinth Biochar: Isothermal, Kinetic and Thermodynamic Studies.

Abstract

Adsorption of Caffeine and Ciprofloxacin onto Pyrolytically Derived Water Hyacinth Biochar: Isothermal, Kinetic and Thermodynamic Studies Full-Text PDFDownload XML 10 Views DOI:10.17265/1934-7375/2016.04.006 Author(s) Emily Chelangat Ngeno, Francis Orata¹, Lilechi Danstone Baraza, Victor Odhiambo Shikuku and Selly Jemutai Kimosop Affiliation(s) ABSTRACT In this work, the adsorptive features of water hyacinth (*Eichhornia crassipes*) derived biochar for sequestration of ciprofloxacin and caffeine from aqueous solution is reported. The isothermal behaviour, adsorption kinetics, mechanisms and thermodynamic parameters were investigated in batch mode. Langmuir and Freundlich models described the equilibrium adsorption data with regression values > 0.9. The kinetics data obeyed the pseudo-second-order kinetic law while intraparticle pore diffusion was not the only rate controlling step. The computed thermodynamic parameters, namely change in Gibbs free energy (ΔG), change in enthalpy (ΔH) and change in entropy (ΔS) indicated that the adsorption processes were spontaneous and exothermic with less randomness. pH dependence studies depicted multi-mechanistic adsorption for both compounds and is hypothesized to involve hydrophobic interactions besides other non-coulombic interactions. The findings demonstrate that water hyacinth biochar presents an excellent low cost and environmentally benign adsorbent for mitigation of pharmaceuticals from water with a removal efficiency of above 60 % for caffeine and ciprofloxacin. KEYWORDS Adsorption, ciprofloxacin, caffeine, biochar, water hyacinth.

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