(ID 261)

Removal of Ciprofloxacin from Aqueous Media Using Dendro Biochar

Attanayake, A.M.P.M.[1], Rajapaksha, A.U.[2,3]*, Liyanage, S.S.L.W[1], Hettithanthri, O.[2], Vithanage, M.[2]

[1]Department of Chemistry, University of Sri Jayewardenepura, Nugegoda, Sri Lanka
[2]Ecosphere Resilience Research Center, University of Sri Jayewardenepura, Nugegoda, Sri Lanka
[3]Instrument Center, University of Sri Jayewardenepura, Nugegoda, Sri Lanka
*anurajapaksha@sjp.ac.lk

Abstract

Ciprofloxacin (CPX) is an emerging contaminant concern; hence this study is aimed to investigate the potential of bioenergy plant derived biochars (Dendro) (Produced from plants available in Embilipitiya (EBC), Mahiyanganaya (MBC), and Thirappane (TBC)) in the mitigation of CPX from the aqueous medium. The physiochemical properties of the biochar were characterized by the proximate analysis and Fourier Transform Infra-Red Spectroscopy (FTIR). Batch adsorption studies were conducted to study the effect of pH (2-9), contact time (0-2,880 minutes), and initial concentration (5-100 mgL^{-1}). The maximum adsorption of CPX onto three biochar samples was facilitated around pH values of 6.5 and 7. Experimental kinetic data were best fitted with pseudo second order (R^2=0.846) for MBC while Elovich model described the kinetics for EBC (R^2=0.923) and TBC (R^2=0.854) in aqueous medium. Isotherm data for aqueous medium were well described by the Langmuir model for EBC (R^2=0.936), Freundlich model for MBC (R^2=0.985), and Temkin model for TBC (R^2=0.985). Obtained data confirmed that EBC followed chemisorption and physisorption interactions meanwhile MBC and TBC showed physisorption interactions. EBC reported the highest maximum adsorption capacity value as high temperature produced biochar exhibits greater potential in the removal of organic contaminants. Distribution coefficient values calculated for three biochar samples showed a positive correlation with adsorption in aqueous medium. Furthermore, colloids were fabricated to study the adsorption with varying pH in comparison with the pristine form. According to the studies, colloidal form of TBC and MBC showed significant adsorption compared to EBC with its pristine form as the ball milling may have increased the surface area which aids in the adsorption. FTIR data suggested the presence of hydroxyl groups, aromatic nature on the surface of the biochar. Isotherm studies conducted using synthetic hydrolysed urine matrix using MBC and MBC colloids suggested a chemisorption mechanism dominated in the adsorption of CPX onto biochar in competitive ions. Thus, these outcomes imply that bioenergy plant derived biochar can be utilized as a potential low-cost, sustainable adsorbent in mitigating emerging contaminants such as CPX from the environment.

***Keywords**:* Carbon materials, Emerging contaminants, Antibiotics, Adsorption