Applications and Data Analysis Using Bayesian and Conventional Statistics in Biochar Adsorption Studies for Environmental Protection

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Abstract

The use of low-cost agricultural waste-derived biochar in solving water and environmental challenges induced by climate change was investigated and sound conclusions were presented. Water reuse strategies can diminish the impact of climate change in rural and remote areas of developing countries. The novel biochar materials from three agro-waste biomass (Matamba fruit shell, Mushuma, and Mupane tree barks) were investigated and characterized to attest to their capacity to remove iodine from the aqueous solution. Their surface morphologies were assessed using Field Emission Scanning Electron Microscopy with Energy Dispersive X-Ray Spectroscopy (FESEM-EDX) which exhibited their structural phenomena to purge environmental pollutants. The Fourier-transform infrared spectroscopy (FTIR) was conducted to show surface functional groups of the biochar materials and Matamba fruit shell exhibited hydroxyl (-OH), carbonyl groups (C=O), C=C stretches of aromatic rings, and the carboxylate (C–O–O–) groups on its surface with corresponding data from the Isotherm and Kinetic models, statistically analyzed by the conventional and Bayesian methods. These surface mechanisms are said to be induced by weak van der Waals forces and - and -stacking interaction on the biochar surface. These adsorbents promised to be potential materials for environmental-ecosystem-protection and water re-use approach.

Keywords: Adsorption, Bayesian statistics, Matamba fruit shell, Mushuma bark biochar, Mupane bark biochar.