BREAKTHROUGH CURVE ANALYSIS OF PHOSPHATE ION ADSORPTION ON ACTIVATED CARBONS FROM DIFFERENT BIOMASS MATERIALS

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ABSTRACT

The problem of water scarcity, water pollution and cost of accessing water for domestic needs have generated serious concerns to the ever-increasing global population. As a result, wastewater remediation has long been accepted as a viable option to mitigate this water scarcity. Therefore, this research was aimed at renovating grey water (wastewater) using the concept of breakthrough curve analysis to assess the effect of particle size and performance of different biomass activated carbons on the adsorption of phosphate ion from the wastewater. Three biomass materials were used in this study: These are Fig (*Ficus sycomous*), Mahogany (*Khaya senegalenses*) and Shea tree (*Vitellaria paradoxa*) which were collected from Samaru area of Zaria, Nigeria. Each of the biomass material was pyrolyzed at a temperature of 650^{o}C and activated with 10% sulphuric acid. The resulting activated carbons were segregated into the two particle sizes of 0-2mm and 2-5mm diameter. A set of adsorption columns of 101.6mm internal diameter and 400mm length was employed for the adsorption of phosphate ion from greywater fed to the column in a downward flow mode. Effluent from the column outlet were analysed for un-adsorbed phosphate ion. Thus, it was observed that at 10% breakthrough, 0-2mm particle size of the three activated carbons employed in this study recorded higher adsorption capacity than 2-5mm particle size while at 30% breakthrough, 2-5mm particle size was noted for higher adsorption capacity. Also, performance of the three activated carbons in their total adsorption of phosphate ion from greywater was observed to be in the order Shea tree>Fig>Mahogany with 1.36, 0.87 and 0.70 mg/g respectively at 10% breakthrough as well as 5.17, 4.24 and 4.03 mg/g respectively at 30%. Breakthrough. In conclusion, this paper has revealed that, for adsorption of phosphate ions from grey water, Shea tree activated carbon has the highest adsorption performance and this was followed by Fig activated carbon while Mahogany activated carbon has the least adsorption performance.

Keywords: Biomass, biochar, greywater, activated carbon, adsorption
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