World Academy of Science, Engineering and Technology
International Journal of Environmental and Ecological Engineering
Vol:15, No:08, 2021

Preparation and Characterization of AlkylAmines' Surface Functionalized Activated Carbons for Dye Removal

Authors : Said M. AL-Mashaikhi, El-Said I. El-Shafey, Fakhreldin O. Suliman, Saleh Al-Busafi

Abstract : Activated carbon (AC) was prepared from date palm leaflets via NaOH activation. AC was oxidized using nitric acid, producing oxidized activated carbon (OAC). OAC was surface functionalized using different amine surfactants, including methylamine (ONM), ethylamine (ONE), and diethylamine (ONDE) using the amide coupling process. Produced carbons were surface characterized for surface area and porosity, X-ray diffraction, SEM, FTIR, and TGA. AC surface area (580 m^2/g) has shown a decrease in oxidation to 260 m^2/g for OAC. On amine functionalization, the surface area has further decreased to 218, 108, and 20 m^2/g on functionalization with methylamine, ethylamine, and diethylamine, respectively. FTIR and TGA showed that the nature of amine functionalization of AC is chemical. Methylene blue sorption was tested on these carbons in terms of kinetics and equilibrium. Sorption was found faster on amine-functionalized carbons than both AC and OAC, and this is due to hydrophobic interaction with the alkyl groups immobilized with data following pseudo second-order reaction. On the other hand, AC showed the slowest adsorption kinetic process due to the diffusion in the porous structure of AC. Sorption equilibrium data was found to follow the Langmuir sorption isotherm with maximum sorption found on ONE. Regardless of its lower surface area than activated carbon, ethylamine functionalized AC showed better performance than AC in terms of kinetics and equilibrium for dye removal.

Keywords : activated carbon, dye removal, functionalization, hydrophobic interaction, water treatment
Conference Title : ICWAT 2021 : International Conference on Water Augmentation and Treatment
Conference Location : Istanbul, Türkiye
Conference Dates : August 16-17, 2021