

Polycyclic aromatic hydrocarbons removal from vehicle-wash wastewater using activated char

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ABSTRACT

In this study, waste polyethylene terephthalate (wPET) and waste polystyrene (wPS) was converted into activated char (AC) and utilized for the removal of polycyclic aromatic hydrocarbons (PAHs) from vehicle-wash wastewater (VWW). AC was prepared by carbonization in nitrogen atmosphere at high temperature followed by chemical activation with 1 M KOH and HCl. The AC was investigated by surface area analyser, Fourier-transform infrared spectroscopy as well as scanning electron microscopy. The removal of PAHs from VWW through AC was examined by batch adsorption tests. Adsorption factors, including; initial PAHs concentration, contact time, temperature, and adsorbent dose were studied. The PAHs contents were measured by using a UV spectrometer and the adsorption efficiency was calculated under optimal conditions. Kinetic and isotherm models were applied to evaluate the adsorbents' capacity for PAHs adsorption. Kinetic studies have shown that the adsorption of these PAHs on AC follows pseudo-second-order kinetics. Experimental results show that both Langmuir and Freundlich isotherm models are most suitable for this data. The calculated thermodynamic factors such as entropy change (ΔS°), enthalpy change (ΔH°) and free energy change (ΔG°) indicate that the adsorption process is essentially non-spontaneous and exothermic. This examination revealed that the novel AC presents a large potential in the PAHs elimination and recovery from VWW.

Keywords: Polycyclic aromatic hydrocarbons; Char; Vehicle-wash wastewater; Sorption experiments

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