Removal of selected polycyclic aromatic hydrocarbons from aqueous solution onto various adsorbent materials

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\textbf{ABSTRACT}

Adsorption of three polycyclic aromatic hydrocarbons (PAH) in one mixture, namely naphthalene (NA), phenanthrene (PH), and pyrene (PY), was tested using various adsorbent materials: Bone charcoal (B-1 and B-2), Peat Moss (PM), Pyrolysis Residue (PR), Activated Rice Husk (RH), and powdered activated carbon (PAC). It was found that adsorption capacity RH carbon for PAH is comparable with the conventional adsorbent (PAC). Kinetics, equilibrium, and thermodynamic studies were carried out for the adsorption of selected PAH on RH carbon in single-component systems. Two days are sufficient contact time between each solute and the RH carbon. Intraparticle mechanism was proved for all compounds. Langmuir, BET, Freundlich, Redlick–Peterson, Toth, Generalized and Fritz–Schülder isotherm equations were studied. It was found that the Freundlich isotherm for NA, Generalized isotherm for PH and BET isotherm for PY gave an excellent overall fit. The fitting was improved independent on the number of isotherm parameters. The calculated values of dimensionless separation factor \( R_L \) of NA, PH, and PY were between 0 and 1 supporting the adsorption of PAH compounds onto RH carbon is very favorable. The results indicated the exothermic nature of PH adsorption onto RH carbon. Thermodynamic parameter was determined. Comparison with other studies was investigated.

\textit{Keywords:} Adsorption; Polycyclic aromatic hydrocarbons (PAH); Activated rice husk; Adsorption isotherms and water treatment