

The Adsorption of Perfluorooctanoic Acid on Coconut Shell Activated Carbons

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Abstract : Perfluorooctanoic acid (PFOA) is one of per- and polyfluoroalkyl substances (PFAS) that have increasingly attracted concerns due to their global distribution in environment, persistence, high bioaccumulation, and toxicity. It is important to study the effective treatment to remove PFOA from contaminated water. The feasibility of using commercial coconut shell activated carbon produced in Thailand to remove PFOA from water was investigated with regard to their adsorption kinetics and isotherms of powder activated carbon (PAC-325) and granular activated carbon (GAC-20x50). Adsorption kinetic results show that the adsorbent size significantly affected the adsorption rate of PFOA, and GAC-20x50 required at least 100 h to achieve the equilibrium, much longer than 3 h for PAC-325. Two kinetic models were fitted to the experimental data, and the pseudo-second-order model well described the adsorption of PFOA on both PAC-325 and GAC-20x50. PAC-325 trended to adsorb PFOA faster than GAC-20x50, and testing with the shortest adsorption times (5 min) still yielded substantial PFOA removal (~80% for PAC-325). The adsorption isotherms show that the adsorption capacity of PAC-325 was 0.80 mmol/g, which is 83 % higher than that for GAC-20x50 (0.13 mmol/g), according to the Langmuir fitting.

Keywords : perfluorooctanoic acid, PFOA, coconut shell activated carbons, adsorption, water treatment

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