

Mass-Transfer Processes of Textile Dyes Adsorption onto Food Waste Adsorbent

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Abstract : The adsorption of methylene blue and congo red dyes in an aqueous solution, on a food waste adsorbent: potato peel, and on a commercial adsorbent: activated carbon powder, was investigated using batch experiments. The objective of this study is the valorization of potato peel by its application in the elimination of these dyes. A comparison of the adsorption efficiency with a commercial adsorbent was carried out. Characterization of the potato peel adsorbent was performed by scanning electron microscopy coupled to energy-dispersive X-ray spectroscopy, Fourier transforms infrared spectroscopy, X-ray diffraction, and X-ray fluorescence. Various parameters were analyzed, in particular: the adsorbent mass, the initial dye concentration, the contact time, the pH, and the temperature. The results reveal that it is about 98% for methylene blue-potato peel, 84% for congo red-potato peel, 84% for methylene blue-activated carbon, and 66% for congo red-activated carbon. The kinetic data were modeled by different equations and revealed that the adsorption of textile dyes on adsorbents follows the model pseudo-second-order, and the particular extra diffusion governs the adsorption mechanism. It has been found that the adsorption process could be described by the Langmuir isotherm.

Keywords : bioadsorbent, waste valorization, adsorption, textile dyes

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