

Removal of Organic Compounds Using Chemically Modified Mixtures of Olive Cake and Wheat Straw Under Batch Processing

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Abstract

Olive cake and wheat straw, two different by-products of agro-food industries, are the most abundant lignocellulosic biomasses among agricultural residues in the world. Olive cake is a by-product of olive oil production and is a solid material consisting of seed particles and the fleshy parts of olive. Wheat straw is a by-product obtained after harvesting of wheat grains. Adsorbents, which derived from olive-cake (OL.C.) and wheat straw (W.S.) in pellet form, have been produced by the chemical activation of the corresponding raw materials and their adsorptive properties were studied with methylene blue dye solutions (MB). The materials (100% W.S., 100% OL.C., 50-50% and 30-70% w./w. OL.C./W.S.) were activated using HCL acid solutions of 5M. The adsorptive properties of raw materials were also examined after their activation at 8M HCL acid. The increase in the adsorption capacity of each sample (% dye adsorption), that have been activated in 5M HCL solution for the first 12h, follows: 100% W.S. (93.21%) > 30-70% w./w. OL.P./W.S. (90,31%)>50-50% w./w. OL.P./W.S. (84.69%)>100% OL.P., (69.45%). The activation of raw materials to higher HCL acid concentration, i.e. 8M than 5M, shows a decrease in MB dye adsorption percentages equal to 92.50% for 100% w./w. W.S. and 63.75% for 100% w./w. OL.S during the first 12h. The implementation of different kinetic models, i.e. pseudo-first order, pseudo-second order, Elovich and intraparticle diffusion shows that the pseudo-second order kinetic model describes better the experimental adsorption data. In conclusion, chemically activated wheat straw alone or in combination with olive cake can be used as filters for the purification of water from organic compounds such as dyes reducing the by-product amounts released to the environment.

Keywords: olive cake, wheat straw, methylene blue dye, kinetic analysis