



Removal of textile dyes from aqueous solutions by lignin and its derivative charcoals: characterization, adsorption kinetics and isotherms

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ABSTRACT

This work focuses on the adsorption in aqueous solution of methylene blue (MB) and methyl orange (MO) on raw lignin (RL), on its derivative charcoals (LC and ACL) and on commercial activated carbon (CAC) taken as reference. Derivative charcoals are the lignin char (LC) and the activated carbon of lignin (ACL). The adsorbents were characterized by infrared spectroscopy, transmission electron microscopy and specific surface area measurements. The optimum conditions determined using experimental designs are 50 mg of lignin, 5 mg/L of dye and 30 min contact time. The studied response is the retention rate. As regards the RL, MB is better adsorbed than MO. As for LC, the adsorption of MB and that of MO are equivalent but are significantly lower than on RL. On the other hand, with ACL, the adsorption of MB and that of MO are higher than those on RL and LC. Infrared analysis reveals that the responsible functional groups of adsorption are present in RL and in ACL, but not in LC. Besides, the specific surface area value of LC is significantly lower than those of RL and ACL. The adsorption of MB on ACL is comparable to that on CAC, while that of MO is higher. IR analysis showed the fixation of MB and MO on ACL. The adsorption process of the two dyes both on RL as on ACL is controlled by chemisorption and the two dyes are adsorbed in multilayers on heterogeneous surfaces.

Keywords: Lignin; Lignin char; Activated carbon of the lignin; Commercial activated carbon; Adsorption; Methylene blue; Methyl orange

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