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Thermodynamic and kinetic studies of adsorptive removal of toluidine blue by activated carbon from olive pit

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ABSTRACT

Activated carbon from olive pit (ACop) was prepared by H_3PO_4 and KOH activation followed by carbonization at 280°C. The ACop was characterized with physical techniques such as scanning electron microscopy (SEM), X-ray diffraction, Fourier transform infrared spectroscopy, Brunauer–Emmett–Teller (BET) surface area and pore size analyzer. The SEM images reveal porous nature of ACop; BET surface area and total pore volume of ACop were 1,209 m^2/g and 0.78 cm^3/g, respectively. The adsorption capability of ACop was tested for the removal of toluidine blue (TB) from aqueous solution in a batch type and fixed bed column reactor at experimental conditions such as temperature, adsorbent dosage, time, pH and initial dye concentrations. Batch studies show that the adsorption of TB on ACop proceeds through pseudo-second-order kinetics and follow Temkin adsorption isotherm at optimal reaction conditions. Fixed bed column studies revealed the industrial applicability of ACop for TB removal from industrial effluent. Thus, ACop can be a suitable adsorbent for the removal of TB from aqueous medium.

Keywords: Olive pit; Phosphoric acid; Adsorption; Toluidine blue

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