



Removal of paracetamol from water and wastewater by Jordanian olivine: influence of ultrasonication

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Received 17 May 2022; Accepted 18 July 2022

ABSTRACT

The removal of the widely used drug (paracetamol) from water using Jordanian olivine was investigated. The olivine was characterized using the scanning electron microscopy-energy dispersive spectroscopy and the Fourier-transform infrared spectroscopy (FT-IR) analyses. The effect of the temperature, contact time, and ultrasonic waves at an ultrasonic frequency of 37 kHz on the removal of paracetamol was considered. The concentration of paracetamol was measured using the FT-IR analysis method. Thermodynamic parameters of adsorption were determined. The kinetics data were obtained under normal conditions and with ultrasonic waves. The percentage of paracetamol removed was increased with increased time in the presence of the ultrasonic waves (with maximum removal of 97.12% at 60 min) using 0.5 g of olivine. The adsorption of paracetamol was found to be unfavorable/non-spontaneous (with ΔG° 2.272–5.075 kJ mol⁻¹), exothermic ($\Delta H^\circ = -2.674$ kJ mol⁻¹) and physisorption in nature. From the kinetics studies, the amount of paracetamol adsorbed (Q_e) was improved due to the combined effects of adsorption with ultrasonic waves. Jordanian olivine can be utilized with great efficiency for the treatment of paracetamol-containing water and wastewater.

Keywords: Paracetamol; Adsorption; Wastewater treatment; Ultrasound; Kinetics.

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