Abstract

This work aims to study and model the sorption of boron and rhodamine B, from their aqueous solutions, by a natural, unconventional, low-cost and locally available biomaterial: olive pomace. The effects of the operating parameters (pH, contact time, pollutant concentration, mass of the adsorbent and the temperature of the medium) on the sorption of these pollutants have been studied and discussed.

The adsorption of boron by olive pomace is an exothermic phenomenon which increases with increasing pH, reaches a maximum around pH 8.5 and decreases with further increase in pH. The results obtained relating to the kinetics and the adsorption isotherms were used to clarify the mode of attachment of the pollutant to the adsorbent. Sorption studies revealed that pseudo-first-order isothermal and Langmuir models are the most suitable to describe boron adsorption kinetics and their equilibrium, respectively.

Analysis of the experimental results reveals that the adsorption of rhodamine B by olive pomace conforms to the Langmuir adsorption isotherm model. Moreover, the pseudo-second-order kinetic model is the most suitable for describing the phenomenon. The adsorption capacity of olive pomace in rhodamine-B remains controlled by the conditions of implementation. Kinetic studies have shown that the sorption process reaches equilibrium after 120 minutes. The maximum rhodamine sorption capacity by olive pomace is 79.8 mgg^{-1}. This result is achieved at 285 K, a pH of 4 and with a contact time of 120 minutes.

The study by infrared spectroscopy demonstrates that the adsorption of boron on olive pomace involves the superficial hydroxyl groups of the adsorbent as binding sites. Similarly, comparison of the FTIR spectra of OP before and after RhB adsorption provides direct evidence for the involvement of surface hydroxyl, carboxyl, and amino functional groups in RhB binding.

Keywords: Boron; Rhodamine B; Biosorption; Olive pomace; Sorption kinetics.