Development of highly porous activated carbon from Jacaranda mimosifolia seed pods for remarkable removal of aqueous-phase ketoprofen

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Abstract

In this work, a high porous activated carbon from Jacaranda mimosifolia was developed and employed for ketoprofen adsorption. After the pyrolysis process at 973.15 K, the material presented cavities with different sizes allocated on the particle surface. The material presented a pH at the point of zero charge of 4.1 with the best adsorption at pH 2. The best adsorbent dosage was 0.72 g L−1, corresponding to a removal of 96%. The system reached the adsorption equilibrium after 120 min and was described by the linear driving force model. The isotherms revealed that the adsorption capacity decreased with the temperature and followed the Langmuir model, with a maximum adsorption capacity of 303.9 mg g−1. This high capacity can be associated with the high surface area (928 m2 g−1) and pore volume (0.521 cm3 g−1) values. The thermodynamic values indicated that the adsorption system is spontaneous and exothermic. The enthalpy value indicates that the interactions between the adsorbent and adsorbate are physical. Regeneration tests showed a decreasing percentage of removal of 7.86% after 5 cycles. Finally, the adsorbent showed efficiency when treating a simulated effluent containing drugs and inorganic salts, showing the removal of 71.43%.

Keywords

Activated carbon, Jacaranda mimosifolia, Ketoprofen, Adsorption