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Atenolol sequestration using activated carbon derived from gasified Glyricidia sepium

Abstract

Activated carbon (AC) derived from gasified Glyricidia sepium woodchip (GGSWAC) was prepared using KOH and CO_2 activation via microwave radiation technique to remove atenolol (ATN) from aqueous solution. The surface area (S_{BET}) and total pore volume (TPV) of GGSWAC were 483.07 m^2/g and 0.255 cm^3, respectively. The n-BET model fits well with the isothermal data indicating a multilayer adsorption with the saturation capacity of 121, 143 and 163 mg/g at 30, 45 and 60 °C, respectively. The kinetic study showed that ATN adsorption followed Avrami model equation ($R^2 \cong 0.99$). Based on the thermodynamic parameters, the adsorption of ATN onto GGSWAC was endothermic (ΔH_S = 234.17 kJ/mol) in the first layer of adsorption and exothermic in the subsequent layer (ΔH_L = −165.62 kJ/mol). The ATN adsorption was controlled by both diffusion and chemisorption. In continuous operation, the Thomas (R^2 = 0.9822) and Yoon–Nelson (R^2 = 0.9817) models successfully predicted the ATN adsorption.

Keywords

Activated carbon; Adsorption; Atenolol; Glyricidia sepium; Multilayer adsorption