

A Novel Pretreatment Method of Lignocellulosic Material as Adsorbent and Kinetic Study of Dye Waste Adsorption

Abstract

Sulphuric acid-modified bagasse has been used as low-cost adsorbent for the removal of methylene blue (MB) dye from aqueous solution. In order to remove organic compounds that contribute to chemical oxygen demand (COD), pretreatment with thorough washing of adsorbent using boiling distilled water was performed instead of conventional washing using distilled water at room temperature only. This has resulted in the highest efficiency of color removal of 99.45% and COD reduction of 99.36% for MB dye solution at pH 9. Effects of initial pH, dye concentration, adsorbent dosage, temperature, and contact time have been studied. The adsorption of MB dye was pH dependent. Langmuir and Freundlich isotherm models were tested on the adsorption data. The kinetic experimental data were analyzed using pseudo-first order, pseudo-second order, and the intraparticle diffusion model in order to examine the adsorption mechanisms. The adsorption process followed the Langmuir isotherm as well as the Freundlich isotherm and pseudo-second-order kinetic model. The process was found to be endothermic in nature.