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Removal of phenol from wastewater using a rice husk based adsorbent

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Phenolic compounds are widely used in the industrial sector and the contamination of water by such compounds is a major environmental problem. The presence of phenolic compounds in wastewater cause serious discharge problems due to their toxicity and poor biodegradability. Adsorption is proven to be an effective method of removing contaminants from wastewater. This work investigates adsorption of phenol onto thermally treated rice husk from aqueous solutions. Rice husk was washed and thermally treated at 700 °C for 1 hr. Batch experiments were conducted to determine the factors affecting adsorption and kinetics of the process. Thermally treated rice husk is capable of adsorbing appreciable amounts of phenol from aqueous solutions. No significant effect of initial solution pH on adsorption was observed. Experiments on the effect of adsorbent particle size on adsorption shows high percentage removal and high rate of adsorption for fine particle size compared to coarse particle size fractions. The adsorbent to solution ratio affects the degree of phenol removal and percentage removal capacities of 40 and 95 were observed with 1 g and 15 g of adsorbent dose per liter of wastewater respectively. The equilibrium data were satisfactorily fitted to Freundlich isotherm and the parameters showed favourable adsorption. Phenol uptake of 16 mg per gram of adsorbent was observed when the waste water containing 100 mg of phenol/L is treated with an adsorbent dose of 15 g/L. Tests on phenol removal as a function of time show rapid initial adsorption rate followed by a slower rate. Kinetic data were fitted to the Pseudo second order model and initial adsorption rates and rate constants were determined.

Key words: adsorption, phenol, rice husk

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