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Utilization of Non-conventional low cost Adsorbents for treatment of Industrial Wastewater

ABSTRACT

The thesis deals with the utilization of various low cost adsorbents for the adsorptive removal of pollutant dyes and heavy metal ions from aqueous solution. It comprises of six chapters. Chapter I deal with introduction and literature review.

Chapter II describes the methods employed for the characterization of adsorbents and the adsorption experiments. The equilibrium, kinetics and thermodynamics of the uptake of dyes and metals by adsorbents from aqueous solution were studied.

In Chapter III acid activated mango leaf powder (MLP) was employed as a low cost adsorbent for the removal of rhodamine B (RB) and congo red (CR) dyes from aqueous solution. The equilibrium was attained after 45 and 15 min. for RB and CR dyes, respectively. The adsorption capacity of MPL for RB and CR were found to be 3.31 and 8.57 mg/g, respectively. The adsorption of RB dye was best described by Langmuir isotherm model whereas the Generalized isotherm model correlated the

data well for CR dye adsorption. The kinetic data conformed to Lagergren's pseudo-first order and pseudo-second order models for RB and CR dyes, respectively. Thermodynamic parameters indicated that the adsorption process to be spontaneous, endothermic, and accompanied with increase in entropy.

The chapter IV deals with the results and discussion of the studies on the efficiency of Chir pine sawdust (CPS) for adsorptive removal of Congo red (CR) and methyl violet (MV) dyes from aqueous solution using batch method. The equilibrium was attained after 45 and 30 min. for CR and MV dyes, respectively. The Freundlich isotherm model satisfactorily described the adsorption of CR dye, while Langmuir isotherm model was best fitted for MV dye. The adsorption of CR dye onto CPS followed Lagergren's pseudo-first order kinetic model, while pseudo-second order kinetic model described the MV adsorption satisfactorily. Thermodynamic parameters indicated the adsorption was spontaneous, endothermic and accompanied with increase in entropy. The adsorption capacity of CPS for MV and CR was found to be 10.41 and 5.32 mg/g, respectively.

In chapter V, the batch adsorption studies for the removal of the arsenic(III) and chromium(VI) ions from aqueous solution using chir pine sawdust is discussed. The equilibrium was attained after 45 and 30 min. for As(III) and Cr(VI), respectively. The Generalized isotherm satisfactorily described the adsorption of As(III), while Temkin isotherm was best fitted for Cr(VI) removal. The kinetics of adsorption of both As(III) and Cr(VI) best conformed to pseudo-second order model. Thermodynamic parameters indicated that the adsorption was spontaneous, feasible and endothermic in nature. The adsorption capacity of CPS for As(III) and Cr(VI) were found to be 13.33 and 1.42 mg/g, respectively.

In chapter VI about 271 references are arranged in alphabetical order.