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ORIGINAL PAPER

Cadmium removal from aqueous solutions using hybrid eucalyptus wood based activated carbon: adsorption batch studies

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Abstract Activated carbon has been equipped from wood of Hybrid Eucalyptus. Its adsorption capacity in elimination of cadmium from wastewater has been examined during batch adsorption experiments. The adsorption kinetics of this particular carbon for several factors such as adsorbent dosage and contact time of the cadmium were identified. The cadmium adsorption characteristics and the effect of the initial cadmium concentration on elimination capability were also studied. The optimum dosage of *Hybrid Eucalyptus* wood based activated carbon to remove 80 mg/L of cadmium from aqueous solution was 1.0 g/150 mL and the optimum contact time was 30 min. The isotherm data fit with both Langmuir and Freundlich isotherm models.

Keywords Adsorbents · Wastewater treatment · Cadmium · Hybrid Eucalyptus · Langmuir and Freundlich isotherms

Introduction

The heavy metals such as Cadmium, Chromium, Lead, Arsenic, Cobalt, etc. are the major poisonous substances that are present in water bodies (Gardea-Torresdey et al. 2000). Industries like electroplating industry, dye industry, metal finishing industry, and chemical manufacturing units are the major principal sources of discharging the poisonous heavy metals into the water bodies (Bishnoi et al. 2004). Moreover, heavy metals are biologically nondegradable and remain on earth for a long time (Low et al. 1999). The concentration of the heavy metals must be lessened to permissible limits before they are discharged into environment or else it will cause danger to the health of human beings, animals, and plants when they consume the polluted water (Babel and Kurniawan 2000). The ill effects of the heavy metals on human beings, animals, and plants vary from time to time depending on the concentration and individual fitness. Human beings take the poisonous metals by contaminated food and drinking the contaminated water (Hamadi et al. 2001). Large number of treatment methods are available for the removal of Cadmium from industrial wastewater. They are Chemical Precipitation, Ion Exchange, Filtration, Membrane Separation, Adsorption, Oxidation, and Reduction. Of all the methods, Adsorption is found to be effective and has low cost (Nomanbhay and Palanisamy 2005; Chuah et al. 2005; Bayrak et al. 2006; Mahvi et al. 2005).

So far, many agricultural waste materials such as Waste Tea fungal biomass (Murugesan et al. 2006), *Tamarindus Indica* seeds (Agarwal et al. 2006), *Terminalia Arjuna* nuts with Zinc Chloride (Mohanty et al. 2005), *Macadamia* Nut Shell (Wang et al. 2002), Fruit shell of *T. Catappa* (Stephen Inbaraj and Sulochana 2006), Bagasse-Fly ash (Gupta and Imran Ali 2004; Mohan and Singh 2002), Oat nut shells (Chuang et al. 2005), Coconut coir pith (Anirudhan and Unnithan 2007), *Candida Utilis* (Kujan et al. 2006), *Fucus Spiralis* (Cordero et al. 2004), *Platanus orientalis* (Mahvi et al. 2007), palm fruit seed (Kannan and

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