CURRENT RESEARCH AND DEVELOPMENT IN BIOTECHNOLOGY ENGINEERING AT IIUM

VOLUME IV

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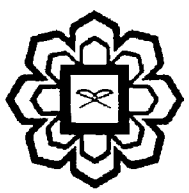

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CHAPTER 12

PERFORMANCE OF CNTS COLUMN IN REMOVING LEAD FROM WATER

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ABSTRACT

Packed column adsorption was carried out to study the capacity of CNTs grown on GACs to remove Pb from water. The effects of bed heights (0.3m, 0.4m, 0.5m) were studied. Three different bed heights of CNTs packed column adsorption study had revealed few patterns of breakthrough curve for concentration of 10 mg/L, pH 5 and 0.015 L/min flow rates. Performances of CNTs packed columns using 0.4 m bed height, 10 mg/L of lead concentration with pH 5 and flow rate of 0.015 L/min were studied in detail. Since the Department of Environment (DOE) Malaysia limit for lead in wastewater is 0.1 mg/L, the breakthrough time was defined at C_e/C_i = 0.01. Results were obtained in terms of column adsorption capacity, height of mass transfer zone (MTZ) and empty bed contact time (EBCT). The study indicated that CNTs had column adsorption capacity of 0.41 mg/g.

Keywords: adsorption, breakthrough curve, CNTs column, mass transfer zone

INTRODUCTION

This research is correlated to the environmental issue where heavy metals are one of the most dangerous threats to the water quality. Nanotechnology application that would result in improved treatment options might include removal of the minute concentration of contaminants from wastewater and air and "smart materials" or reactive surface coatings that destroy or immobilize toxic components (Hua *et al.*, 2005). Progressively, the practicality of the current practice of meeting the water demands of all users according to increasingly stringent standards has been questioned by water scientists and engineers (Weber *et al.*, 2002).

In connection to this project, CNTs grown on granular activated carbons (GACs). The CNTs grown on GACs was used for the purpose of removing lead (Pb^{2+}) which is one of the hazardous heavy metals in wastewater. CNTs have capability of adsorbing pollutants from water, as they exhibit exceptionally large specific surface area (Li *et al.*, 2005). The objectives of the study were, to design and build lab scale packed columns consisting of CNTs grown on GACs and to determine the lifecycle and filtration capacity of the column system in removing lead (Pb) in wastewater.