

CURRENT RESEARCH AND DEVELOPMENT IN BIOTECHNOLOGY ENGINEERING AT IIUM

VOLUME IV

Editors:

Ma'an Alkhatib
Abdullah Al Mamun
Faridah Yusof



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(VOLUME IV)

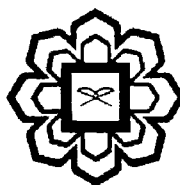
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CHAPTER 11

ADSORPTION OF CADMIUM BY CNTS GROWN ON GACS

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ABSTRACT

The ability of the carbon nanotubes (CNTs) to remove cadmium from aqueous solution has been evaluated in this study. The parameters varied were CNTs dosage, cadmium concentration and contact time. Adsorption study has demonstrated that the highest residuals of cadmium ions are 68.78%. The data obtained from the adsorption experiment were evaluated using Design Expert 6.0.8 in order to develop a regression analysis equation that represents the best operation parameters. The interactions of each parameter were considered during this analysis, and the result indicates that the highest residual (68.78%) of cadmium can be attained at initial concentration of cadmium of 0.6 mg/L, contact time of 80 min and CNTs dosage of 50 mg/L. Comparison between Carbon Nanotubes (CNTs) and Granular Activated Carbon (GACs) were also done and it is determined that (CNTs) has better residual compared to (GACs) alone. Batch mode adsorption study was analyzed by using Langmuir and Freundlich isotherm model. It was found that Langmuir isotherm had a better fitting since it gave high correlation coefficient, 0.9534 compared to Freundlich isotherm model.

Keywords: adsorption, cadmium, CNTs, GACs, water

INTRODUCTION

Cadmium are natural component and to a small extend it enters our bodies via food, drinking water and air. Some heavy metals such as Cadmium, Zinc, Chromium, etc. are poisonous at high concentration (Smith, 2000). The contamination of water by these heavy metals is a significant universal problem. Besides causing gastrointestinal distress such as nausea, vomiting and diarrhea, it can contribute to the damage of lungs and kidneys, pulmonary fibrosis, skin dermatitis and allergic sensitization.

These consequences have increased the public awareness on the importance of removing Cadmium from water. There are several techniques that can be applied such as adsorption, chemical precipitation, filtration, ion exchange and coagulation. Adsorption is reported to be the most common method to be applied due to simplicity and effectiveness. The involvement of complicated procedures, generation of toxic compounds and high operating cost of some other techniques has increased the application of adsorption process for the removal of heavy metal from water.

Many types of adsorbents including activated carbon, crab shells, seaweeds, phosphogypsum and waste factory tea have been used to remove cadmium from water