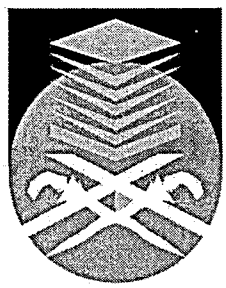
LALANG (*Imperata cylindrica*) AS A LOW-COST ADSORBENT FOR REMOVAL OF LEAD IONS FROM AQUEOUS SOLUTIONS



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ABSTRACT

The removal of lead aqueous solution with agricultural waste particularly Lalang or *Imperata cylindrical* (IC) leaves was investigated by the batch mode method. Effect of various operating variables such as metal ion concentration, solution pH, adsorbent dose, and temperature on the removal of lead was studied. The batch experiments show that pH 4.0 – 5.0 was the best range for the adsorption of lead ions. Time-dependent experiments revealed that binding of Pb(II) ions to the adsorbent reached equilibrium in 90 min for lead concentration of 5 mg/L and 120 min for lead concentration of 20 mg/L. Adsorption of Pb(II) was found to increase with adsorbent dosage. The adsorption capacity experiment revealed that the amount of lead ions bound per gram of adsorbent was 5.89 mg g^{-1}. It was found that the intraparticle diffusion of Pb(II) through pores in the adsorbents was not the only rate limiting step. The adsorption of Pb(II) onto IC leaf powder increases with increasing temperature indicating endothermic nature of adsorption process. Pseudo-second-order model described the adsorption kinetics better than the pseudo-first-order, Ritchie's second order and Elovich model. The studies showed that IC leaves can be used as good adsorbent materials for Pb(II) removal from aqueous solution.

CHAPTER 1

INTRODUCTION

1.1 Introduction

The presence of heavy metals in the environment poses a serious and complex pollution problem that has become a major attention by scientists all over the world. Lead is one of the toxic heavy metals widely discharged into the environment as industrial waste in many developing countries, causing serious soil and water pollution. Lead has been known to pollute the environment by waste streams, which originates from metallurgical industry, electroplating and metal finishing industries, paint manufacture, storage battery manufacture, petroleum refining, and drainage from ore mines. Excessive exposure to lead may also lead to anemia, mental retardation, coma, seizures and bizarre behavior (Botkin and Keller, 2000). Numerous methods have been introduced for removing lead from wastewaters mainly chemical precipitation, chemical oxidation or reduction, ultrafiltration, electrochemical treatment, reverse osmosis, phytoextraction, electrodialysis, application of membrane technology, evaporation recovery, solvent extraction and ion exchange processes. However, the aforementioned techniques are very expensive, may produce large volume of wastes and not economically feasible for small and medium industries (Volesky, 1990; Aksu, 2005).

Adsorption processes using natural adsorbents or agricultural waste products are becoming the new alternative for wastewater treatment because they are cheap, simple, sludge free and involve small initial cost and land investment. Some of the examples of adsorbent materials that have been applied for the removal of lead from aqueous solutions are given in Table 1.