

# 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)***

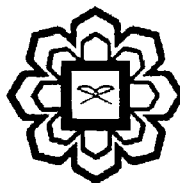
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### KINETIC STUDIES ON ENHANCED MERCURY ADSORPTION USING ACTIVATED CARBON

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#### ABSTRACT

Activated carbons from palm oil are suitable materials for Hg(II) adsorption in a batch process. The batch process tests provide good indication of activated carbons as an effective material, which depends on the rate of Hg(II) adsorption. In order to correlate batch process properties and operation condition with their adsorptive capacity and saturation time, Hg(II) adsorptive tests were realized in a bench scale unit, consisted of 20mg activated carbon dosage. Hg(II) adsorption tests were conducted at 32<sup>0</sup>C, under 1.6 mg/L Hg(II) initial concentrations and with carbon particle sizes ranging from 75-106 and 150-250  $\mu\text{m}$ , pH 6.5, agitation speed of 100 rpm and contact time of 70 minutes. The experimental results were analyzed using Langmuir and Freundlich equations. Correlation coefficients ( $R^2$ ) showed that the Langmuir model was used as it best described the model. Results from this study were described by the Langmuir Isotherm in which the highest adsorption capacity obtained from this analysis was 1.521 mg/g.

**Keywords:** kinetics, palm oil, activated carbon, mercury, Langmuir, pseudo second-order

#### INTRODUCTION

Mercury is a heavy metal and is used widely in the industry. The biggest sources of mercury release according to a report published by the United Nations are from coal-burning power plants and waste incinerators. They account for approximately 70 per cent of man-made emissions. Besides that, mercury is also being used to extract gold in gold mines and this pollutes the waterways and hence will bind to have an effect towards humans and environment. From a long-term follow-up of the affected population showed that the impact was persistent and included a decline in the birth ratio (Cummins, 2003). As a result of industrialization, various kinds of pollutants are being released into the environment daily causing the environment to be polluted. Water pollution is one of the environment essentials being polluted and drastic measures have to be taken in order to conserve water. Without water, life cannot be sustained thus interrupting the balance in the ecological system. In Malaysia, the permissible discharge for mercury is 0.005 mg/L for standard A and 0.05 mg/L for standard B. (Federal Subsidiary Legislation Malaysia, 1979).

Malaysia is one of the major producers and exporters for palm oil (Arulanantham, 1989). There are many plantation estates in order to fulfill the increasing demands from the