ADSORPTION OF OIL FROM AQUEOUS SOLUTION ONTO ENVIRONMENTAL FRIENDLY MICROSORBENT

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5.1 Proposed Executive Summary

Water pollution by oil has left an undesired impact on the environment. The presence of oil in water not only induces detrimental effects to aquatic life but also causes serious problems to wastewater treatment plants. Major sources of oils in contaminated waters come from petroleum, metals, food processing, textile, cooling and heating industries as well as municipal wastewaters. Unlike the free or 'floating' oil spilled in the sea, lakes or rivers, most industrial wastewaters contain oil emulsion, which posess a real problem to treatment due to its high stability and can only be separated with the help of chemical clarification (Ahmad et al., 2005). Adsorption process is one of the interesting methods for removing organic and inorganic pollutants in waterway systems (Kumar et al., 2000). Due to low efficiency and high cost of activated carbon for oily wastewater treatment (Moazed and Viraraghavan, 2005), the possibility of using inexpensive materials as alternatives was explored by many researchers in the past years. Low cost adsorbent could be generated from agriculture waste. Thus, in this study, the agriculture waste such as banana stem and durian shell were selected as biosorbent for oil removal due to its large availability in Malaysia.

5.2 Enhanced Executive Summary

Over the recent years there has been an increasing concern for environmental risk of industrial activities associated with extraction, hydrocarbons, food processing, transportations and refining. These industries have increased the threat of oil pollution to the environment and subsequently concomitant discharged into the natural environment creates major ecological problem throughout the world. The wastewater is detrimental and need to have a treatment before discharge into the environment, in line with Malaysian Environmental Quality Act 1974.

Removal of oil from wastewater can be achieved by several techniques, such as precipitation, flocculation, adsorption, ion exchange, etc. Among the available methods, adsorption using activated carbons has been shown to be one of the most ideal procedures. However, there are a number of problems associated with activated carbons such as combustion at high temperature, pore blocking, and hygroscopicity.

To overcome the problems associated with activated carbons is using alternative adsorbents. The alternative adsorbents could be generated from agriculture waste. These materials are available in large quantities and may have potential as adsorbents due to their physico-chemical characteristics.

In the present study, the ability of banana pseudostem fibers and durian shell as a biosorbent for the removal of oil from synthetic oily wastewater was investigated. A detailed batch study with respect to its adsorption equilibrium, isotherm and kinetics were carried out at ambient temperature, various initial concentration of oil and agitation time. The batch study clearly shows that banana pseudostem and durian shell exhibit almost 100% adsorption at lower concentration of oil. Langmuir and Freundlich adsorption model were applied to describe the experimental isotherm and isotherm constants. Equilibrium data fitted well with Freundlich model. The kinetic data were best fitted to pseudo-second-order kinetic model. The result showed that these low-cost adsorbent had a high adsorption capacity, making it suitable for the oily wastewater treatment.