EFFICIENCY OF ACTIVATED CARBON PRODUCED FROM PET (POLYETHYLENE TEREPHTHALATE) WASTE MATERIALS FOR THE TREATMENT OF MUNICIPAL SOLID WASTE LANDFILL LEACHATE (KODUWAMADU)

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ABSTRACT

Municipal Solid Waste (MSW) is a major growing problem in urban areas of Sri Lanka. Municipal solid waste mainly composed of plastics namely polyethylene terephthalate (PET) waste. In other hand percolation of landfill leachate into the groundwater tables and aquifer system, which poses a potential risk and hazardous towards the public health and ecosystem. Therefore, there is a need for an efficient management of PET waste and also need to treat leachate before discharging into surrounding environment. Even though, there are several methods available to treat the leachate, suitable place and cost of treatments are contentious. The objectives of this study were (i) to produce the activated carbon from PET (Polyethylene terephthalate) waste materials (ii) to determine the adsorption capacity of the activated carbon using Langmuir and Freundlich models and (iii) to determine the efficiency of activated carbon for the treatment of landfill leachate (Koduwamadu). Activated carbon was prepared by carbonization followed by chemical activation with KOH. Adsorption capacity of activated carbon was determined using Langmuir and Freundlich models. The R^2 obtained by Langmuir and Freundlich models were 0.988 and 0.974, respectively. The obtained results shown that the Langmuir isotherm model was fitted well than Frendlich model. The efficiency of activated carbon for the treatment of leachate was evaluated considering the parameters of Total Dissolved Solids (TDS), Chemical Oxygen Demand (COD), Biochemical Oxygen Demand (BOD_5), phosphate, pH and Electrical Conductivity (EC). Leachate was collected from the Koduwamadu MSW landfill and initial value of above mentioned parameters were measured immediately after collection. The treated samples were collected at 3^{rd}, 5^{th}, 7^{th} and 9^{th} day to measure the above mentioned parameters. In 9^{th} day, the maximum removal of TDS (71.44%), COD (84.66%), BOD_5 (69.16%), phosphate (55.16%) was

observed and changes in pH and EC was 7.28±0.2 and 6.49±0.11mS/cm, respectively. This study revealed that activated carbon produced from PET waste materials was an efficient medium for the treatment of leachate. Even though there was a significant reduction of all parameters, TDS and pH was less than CEA permissible level of treated wastewater which could be discharged into inland water bodies. Therefore, it has been concluded that activated carbon for the treatment of landfill leachate shown better performance especially for the removal of TDS and reduction of pH compared to other parameters which were investigated.

Keywords: PET bottles, Activated carbon, Landfill leachate, Methylene blue, Isotherms

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