



Reduction of COD and ammoniacal nitrogen from landfill leachate using granular activated carbon and green mussel adsorbent

Amir Detho^a, Zawawi Daud^{b,*}, Mohd Arif Rosli^c, Mohd Baharudin Bin Ridzuan^a, Halizah Awang^d

^aEnergy & Environment Engineering Department, Quaid-e-Awam University of Engineering, Science and Technology, Nawabshah, Sindh, Pakistan, emails: amirdetho@gmail.com (A. Detho), mdbahar@uthm.edu.my (M.B. Bin Ridzuan)

^bFaculty of Civil Engineering and Built Environment, Universiti Tun Hussein Onn Malaysia, email: zawawi@uthm.edu.my

^cFaculty of Engineering Technology, Universiti Tun Hussein Onn Malaysia, email: mohdarif@uthm.edu.my

^dFaculty of Technical and Vocational Education, Universiti Tun Hussein Onn Malaysia, email: halizah@uthm.edu.my

Received 11 August 2020; Accepted 31 December 2020

ABSTRACT

Landfills leachate always has been considered the utmost problem and is an issue in the management of municipal solid waste. Generally, landfill leachate contains a high concentration of organic and inorganic matter that caused an origin of hydro-geological pollution. In this research analysis, the combination of granular activated carbon (GAC) and green mussel (GM) was determined for the reduction of organic constituents' chemical oxygen demand (COD) and ammoniacal nitrogen ($\text{NH}_3\text{-N}$) from stabilized landfill leachate. This study was investigated to achieve the maximum optimum conditions, speed, time, dose and pH. The characterized result revealed that leachate contains a high concentration of biochemical oxygen demand (BOD_5)/COD ratio (0.09), COD (1,829 mg/L) and ammoniacal nitrogen (406.68 mg/L), respectively. The reduction result revealed that the maximum mixture ratios of media GAC:GM for COD and $\text{NH}_3\text{-N}$ reduction are 2.0:2.0, 200 rpm, 120 min, and 57 g. The findings from isotherm adsorption analysis, the obtained result revealed that the Langmuir adsorption data better fit than Freundlich adsorption. The mixing media provides a strong result for the treatment of leachate wastewater and potentially used as economical good and sustainable adsorbent.

Keywords: Adsorption; Granular activated carbon; Green mussel; Isotherm; Optimum parameters

* Corresponding author.