A laboratory simulation of *in situ* leachate treatment in semi-aerobic bioreactor landfill

Shou-liang Huo[1, 2], Bei-dou Xi[2], Hai-chan Yu[3], Shi-lei Fan[4], Su Jing[2] and Hong-liang Liu[2]

[1] *Environment School, Beijing Normal University, Beijing 100875, China*

[2] *Chinese Research Academy of Environmental Sciences, Beijing 100012, China*

[3] *College of Life Sciences, Beijing Normal University, Beijing 100875, China*

[4] *The College of Architecture and Civil Engineering, Beijing University of Technology, Beijing 100022, China*

Abstract

In this study, two laboratory-scale simulated landfill bioreactors were established, of which Reactor A was operated only with leachate recirculation and served as the control, and Reactor B was operated as semi-aerobic bioreactor landfill with leachate recirculation. *In situ* leachate treatment and accelerating organic decomposition in semi-aerobic bioreactor landfill was investigated. The results indicated that the introduction of air into the landfill was favourable for optimising the micro-organism growth environment and accelerating the degradation of organic matter. It can be seen clearly from the results that NH_4^+-N can be removed *in situ* in the semi-aerobic bioreactor landfill with leachate recirculation. Moreover, semi-aerobic bioreactor landfill showed lower emissions for leachate than those in leachate from anaerobic landfill, with low concentrations of COD, VFA, NH_4^+-N and TKN, and which saved the disposing process of the discharged leachate. The three-dimensional excitation-emission matrix fluorescence spectroscopy (EEMs) of dissolved organic matter (DOM) in Reactor B changed greatly, and fluorescence peak changed from protein-like fluorescence at Day 60 to humic-like fluorescence at Day 95 and 250, while in Reactor A, fluorescence peak of DOM was always protein-like fluorescence. The comparison of the EEMs indicated that the semi-aerobic landfill accelerated the organic decomposition.

Keywords: semi-aerobic landfill, bioreactor landfill, three-dimensional excitation-emission matrix fluorescence spectroscopy (EEMs), *in situ* leachate treatment