

โครงการวิจัยรหัส พ-ท(ค).159.56.

ศักยภาพของจุลินทรีย์เมทาโนโทรฟในการย่อยสลายขยะพลาสติกในหลุมฝังกลบแบบกึ่งมีอากาศ

Potentiability of Methanotrophs in Biodegradation of Plastic Waste in

Semi-Aerobic Landfill

วิไล เจียมไชยศรี และสุธารัตน์ หมั่นมี

Wilai Chiemchaisri and Sutharat Muenmee

Abstract

The bench scales of a semi aerobic landfill were set-up to order to investigate biodegradation of commercial plastic wastes (HDPE, LDPE, PP and PS). A low flow rate of synthetic biogas was purged continuously. Methane oxidation in waste matrix was determined periodically. The wastes had been interval tested for chemicals and microbial consortium. The results appear that the maximum methane oxidation rate (MOR_{max}) was at 15 cm depth and tended to increase with time. Microbial consortium on waste plastics revealed by FISH techniques indicated that all methanotrophs tended to increase with time in an experimental period of 12 months. Growth of Type I and Type II showed highly at different zones of waste matrix: Type I at 5-15 cm depth whereas Type II at 75-140 cm depth. Besides, methanotrophs had attached highly on HDPE>LDPE>PS/PP. Biodegradation of waste plastics in terms of carbon loss, plastic-biodegraded products and micro-optical changes of plastic structure were found conspicuous at high dense methanotrophs on waste plastics. Almost kinetic decay rates, K of plastic degradation showed highest at 15 cm-depth. HDPE had the highest kinetic decay rate (K , $0.288 y^{-1}$) followed by PP ($K = 0.197 y^{-1}$), PS ($K = 0.157 y^{-1}$) and LDPE ($K = 0.131 y^{-1}$) at the MOR_{max} depth, respectively. In conclusion, this experimental study shows that both types of methanotrophs involved degradation of waste plastics in the simulation of open dump site of which the K values depended on plastic properties and amount of attached methanotrophs.

Keywords: Semi aerobic landfill, methane oxidation, methanotrophs, solid wastes, plastics, biodegradation

⁽¹⁾ ภาควิชาวิศวกรรมสิ่งแวดล้อม คณะวิศวกรรมศาสตร์ มหาวิทยาลัยเกษตรศาสตร์

Environmental Engineering Department, Faculty of Engineering, Kasetsart University

