Thermophilic Anaerobic Digestion of Waste Poly(lactic acid) Flake for Biogas Production

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Recently, the use of biodegradable products, including poly(lactic acid) (PLA), has increased, resulting in a rapid increase in municipal solid waste. Anaerobic digestion (AD) of municipal solid waste, leading to the production of renewable energy in the form of biogas, is a preferable method to deal with the increasing waste. The aim of this study was to determine the effect of biogas production from waste PLA flake throughout thermal pretreatment. We compared biogas production from waste PLA flake under thermophilic AD and analyzed the microbiome involved in PLA degradation. Biogas was generated in AD with 428.9 mL/g-PLA, 1.9 times increase compared with the control. Interestingly, the effect of pretreatment showed a different trend depending on microbiome, i.e., Defluviitoga. tunisiensis- vs. Clostridium cellulosi-enriched microbiome. Treatment in water led more biogas production on D. tunisiensis- enriched microbiome. But it showed no effect on C. cellulosi-enriched microbiome. This study showed that the use of an appropriate enriched microbiome and the presence or absence of pretreatment can enhance biogas production and PLA degradation under anaerobic conditions.