

Fate and Effect of Polyamide Microplastics during Anaerobic Digestion Process of Sludge

Microplastics (MPs) which are defined as plastics smaller than 5 mm in size, are easily transported in environmental systems. They reach wastewater treatment plants (WWTPs) in high amounts due to the widespread daily use of plastics. Studies have shown that WWTPs can remove MPs in wastewater at a high rate, but accumulate them in sludge. There is limited information on the effects of MPs accumulated in sludge on stabilization processes. Fate and effect of MPs in anaerobic digestion, a widely used and self-sustaining stabilization process with renewable energy (biogas) production, should be investigated to fully understand the associated effects. The purpose of this study is to determine the fate of MPs in anaerobic digestion process together with evaluation of their effects on the process. For this purpose, polyamide (nylon) (PA), one of the most common polymer types encountered in wastewater treatment plants, are used. The study started by developing repeatable extraction and analyses methods to identify and quantify MPs in sewage sludge, and continued with validation of these methods. Then, specific doses of PA MPs are added to BMP reactors, and the biotic and abiotic reactors were operated for 60 days under mesophilic conditions. Some MP containing reactors operated caused an increase in TS and VS reduction compared to the no MP added control reactors. Methane yield was slightly higher in reactor with 200 MPs/g TS compared to the control reactor. Morphological changes of PA during digestion are also examined. Next, impact of thermophilic temperature mode will be studied under similar set-up and thermophilic conditions.

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