ICAPP 2019
1st International Conference
on Advanced Production and Processing

COMBINATION OF ALKALINE/ACIDIC AND MICROWAVE TREATMENT FOR ENHANCED ANAEROBIC DIGESTION OF SLUDGE

***Zoltán, Jákói*[1], *Sándor, Beszédes*[1], *Balázs, Lemmer*[2], *Andrea, Vágvölgyi*[3], *Cecilia, Hodúr*[1],**
[1]*University of Szeged Faculty of Engineering, Department of Process Engineering, Moszkvai krt. 9, HU-6725 Szeged, Hungary, jakoiz@mk.u-szeged.hu, beszedes@mk.u-szeged.hu, hodur@mk.u-szeged.hu*
[2]*University of Szeged Faculty of Science and Informatics, Doctoral School of Environmental Sciences, Közép fasor 52. HU-6726, Szeged, Hungary, lemmer@mk.u-szeged.hu*
[3] *University of Sopron Faculty of Forestry Engineering, Bajcsy-Zsilinszky u. 4, HU-9400 Sopron, Hungary, vagvolgyi.andrea@uni-sopron.hu*

Abstract

Advantageous effects of microwave irradiation on sludge disintegration and anaerobic digestion are verified by many scientific papers. Acid or alkali dosage with thermal sludge processing has also positive effect on organic matter solubility and biogas yield. Combination of conventionally used chemical methods with microwave irradiation could be a promising pretreatment process with shortened process time demand and enhanced biodegradability.

In our work we focused on the investigation of the applicability and efficiency of continuously flow microwave irradiation of food industry sludge. The change of biodegradability was characterized by the specific biogas yield produced in mesophilic anaerobic digestion.

Our results show that expose the sludge to a standalone microwave treatment with an irradiated energy of 200 kJ L^{-1} and MW power of 600W resulted in a a biogas yield of 390 ± 23 mL gTS^{-1}. At lower power level (450W) increasing of NaOH dosage or irradiated MW energy (kJ L^{-1}) led to increased biogas yield. Biogas yield of microwave-acidic pre-treated sludge was lower, than that of obtained for microwave-alkaline treated samples. At the highest power level (750W) there was no further significant increase in biogas yield when energy intensity increased from 150 to 250 kJ L^{-1} or the NaOH dosage increased from 0.25 to 0.55 gNaOH/gTS. In microwave assisted alkaline sludge treatment the increased dosage of alkali enables to reduce the energy intensity of microwave irradiation, what enhances the overall energy efficiency of the process.

Keywords: Microwave, Sludge, Anaerobic Digestion, Biodegradability

Acknowledgements: This research was carried out as part of the "Sustainable Raw Material Management Thematic Network – RING 2017", EFOP-3.6.2-16-2017-00010 project in the framework of the Széchenyi 2020 program. Authors thank the financial support provided by the NRDI (NKFI) under project number K115691.