

APPLICATION OF MICROWAVE TREATMENTS AND DIELECTRIC MEASUREMENTS IN WASTEWATER AND SLUDGE UTILIZATION PROCESSES

**Sándor Beszédes¹, Balázs Lemmer¹, Zoltán Jákói¹, Andrea Vágvölgyi², Gábor Keszthelyi-Szabó¹,
Cecilia Hodúr¹**

¹Department of Process Engineering, Faculty of Engineering, University of Szeged, Szeged, Hungary

²Faculty of Forestry, University of Sopron, Sopron, Hungary

beszedes@mk.u-szeged.hu

Abstract

Microwave irradiation has been proved to be an effective method for dehydration of biomaterials, and, to increase the disintegration degree of municipal waste activated sludge, for instance. Efficiency of microwave heating is determined by the dielectric parameters, but, however, the structural properties (solubility, change of chemical bonds, ratio of free to bounded water etc.) affect the dielectric characteristic of materials, as well.

In our work we focused on to investigate i) the effects of continuously flow microwave pre-treatment on the aerobic and anaerobic biodegradability of food industry originated sludge, and, moreover, ii) the relationship between the change of dielectric parameters and biodegradability indicators, as well.

The continuously flow microwave pre-treatment was suitable to increase the biodegradability of dairy and meat industry wastewater sludge, which is manifested in higher biogas yield and accelerated mesophilic anaerobic digestion process. Our results verified that the organic matter removal efficiency in a municipal wastewater treatment technology can be detected by dielectric measurements.

A strong correlation was observed between the change of disintegration degree of sludge exposed to microwave irradiation, and the change of dielectric constant. It was also established, that the increment of biodegradability can be detected by dielectric measurements, as well.

Further research is needed to investigate the applicability of dielectric measurement for in-line and real time efficiency estimation and control of microwave assisted pre-treatment process for different originated sludge and other biomaterials.

Key words: microwave, dielectric properties, sludge, wastewater

Acknowledgements: Authors thank the support provided by project EFOP-3.6.2- 16-2017-00010-RING 2017; NKFIH-project No K115691; UNKP-18-3; UNKP-17-4 and János Bolyai Research Scholarship of the Hungarian Academy of Sciences.