

ADVANCED PROCESSES IN WASTEWATER SLUDGE TREATMENT

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ABSTRACT

The amount of wastewater sludge is increasing annually, and since it presents potential environmental and health-related risks, an appropriate treatment and stabilization process is needed. In our present work we investigated the effects of microwave irradiation on the biogas yield gained by the anaerobic digestion of standalone meat industry wastewater sludge (MIWS) on the one hand, and on the other hand, its effects on the co-fermentation of MIWS and lignocellulosic plant waste. We also supplemented our research with monitoring methods, namely dielectric and rheological measurements, to see whether these techniques are capable of tracking the fermentation processes. The anaerobic digestion of sludge and the co-fermentation of sludge – plant waste mixtures were carried out in laboratory anaerobic fermenters, and the biogas yield was measured via respirometric method.

Our results revealed that in terms of total biogas yield the microwave irradiation can enhance the fermentation process of both standalone wastewater sludge and sludge–plant waste mixtures, however in case of the latter, the pre-treatment arrangement plays a key role in the process - the highest biogas yield could be achieved when the sludge–plant waste mixture was exposed to microwave irradiation simultaneously before the co-fermentation. It was also proved that dielectric and rheological measurements are capable of monitoring the fermentation processes; a strong correlation was found between the accumulating biogas yield and the dielectric constant, as well as the absolute viscosity of the fermentation material.