

## **ENHANCED BIODEGRADABILITY OF DAIRY SLUDGE BY MICROWAVE ASSISTED ALKALINE AND ACIDIC PRE-TREATMENTS**

**SÁNDOR BESZÉDES, ZOLTÁN JÁKÓI, BALÁZS LEMMER, CECILIA HODÚR**

University of Szeged Faculty of Engineering Institute of Process Engineering  
Moszkvai krt. 9, H-6725 Szeged, Hungary  
beszedes@mk.u-szeged.hu

Microwave irradiation has been widely used for material processing. Numerous advantages have been verified over the conventional heat treatments, for example the short process time demand, intensive heating and high digestion efficiency. Considering the rapid, volumetric and selective heating effect of microwaves the microwave assisted chemical methods could provide appropriate alternatives for conventional thermal methods in sludge processing. Microwave irradiation alone is suitable to accelerate the hydrolysis stage of anaerobic decomposition of sludge resulted in accelerated biogas production rate and in higher biogas yield. Alkaline pre-treatments increase the organic matter solubility and suitable for disintegration of sludge particles. In some study are concluded that acidic conditions help the disintegration of waste activated sludge and assist in the solubilisation of carbohydrates and proteins which led to increased higher biogas production, as well.

Beside the promising results related to effects of microwave pre-treatments on anaerobic digestion of sludge there are very few reports on the investigation of combined acidic/alkali-microwave pre-treatment method for food industry originated sludge. Hence, our study focused on the examination of the effects of combined microwave-alkali and microwave-acidic pre-treatment on aerobic and anaerobic biodegradability of sludge produced in dairy industry. Aerobic biodegradability was given based on biochemical oxygen demand measurements. Anaerobic biodegradability was characterized by biogas production in batch mesophilic anaerobic digestion tests.

Our experimental results verified, that microwave irradiation with alkaline dosage improve the solubility of organic matters in the pH range of 8-12. But enhancement of disintegration was not correlated linearly with biodegradability. During the pre-treatment stage applying pH over 10 the aerobic biodegradability show decreasing tendency. Applying of acidic condition during microwave irradiation resulted in lower disintegration degree than obtained for microwave-alkaline sludge pre-treatment method. But with microwave assisted acidic pre-treatments a higher aerobic biodegradability could be achieved than with alkaline dosage. In microwave pre-treatments

acidic condition was preferable to increase the shorter time (5 days) aerobic biodegradability; the alkaline condition was favourable to accelerate the anaerobic digestion process. It was verified that beside the irradiated energy the specific microwave power intensity also affect significantly the biodegradability of dairy sludge.

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