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DIELECTRIC MEASUREMENTS AND MICROWAVE PRE-TREATMENTS FOR ENHANCED BIODEGRADABILITY OF WASTEWATER AND SLUDGE

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Microwave irradiation is a promising pre-treatment method for improving sludge stabilization, but there are few studies focusing its effect on organic matter solubility and aerobic biodegradability of wastewater and sludge originated from food industry.

In our researches microwave irradiation was applied standalone and in combination with alkaline treatment to enhance the solubilisation and biodegradation of organic matter content of meat industry wastewater and municipal sludge, respectively. Furthermore, the energy efficiency was calculated, as well. The total and soluble chemical oxygen demand (TCOD, SCOD) was determined photometrically. For the characterization of aerobic biodegradability, biochemical oxygen demand was measured in respirometric BOD meter. Mesophilic anaerobic digestion tests were carried out to investigate biogas production. To detect physicochemical changes, dielectric properties of wastewater and sludge were determined in the frequency range of 200-2400 MHz by an open-ended coaxial probe.

Our experimental results have revealed that the most efficient pre-treatment process from energetically aspects to increase the organic matter solubility and biodegradability of wastewater and sludge were the lower power and energy intensity microwave-alkaline treatments. Moreover, a strong linear correlation was found between the solubility of organic matter (SCOD/TCOD) and aerobic biodegradability (BOD/COD) and the ratio of dielectric constants measured at the frequency of 300 and 2400 MHz in both treated materials, respectively.

Based on our results, dielectric measurement is a suitable method to predict real-time the improvement of biodegradability, and can be considered as a promising method to estimate the efficiency of sludge pre-treatment methods.