MICROWAVE-CHEMICAL PRETREATMENTS FOR ENHANCED BIODEGRADABILITY OF FOOD INDUSTRY SLUDGE

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Microwave irradiation, as biomass pretreatment method, has a good potential to achieve high drying rate, or increase the biodegradability through intensive cell wall destruction effect and rapid disintegration. Researches have been conducted to investigate the efficiency of microwave pretreatments on disintegration and anaerobic digestion kinetic of municipals sludge. But there are known less experiences related to the efficiency and energetic analysis of microwave treatment of food industry effluents, liquid wastes and byproducts.

In our researches the effect of microwave (MW) and microwave-alkaline treatments were investigated on the disintegration degree (DD), aerobic biodegradation and kinetic of anaerobic digestion (AD). Results of ANOVA show that in continuously flow operation mode, beside irradiated energy and alkaline dosage, the specific microwave power intensity has also significant effect on disintegration efficiency and biodegradability indicators. Using the optimized process parameters DD enhanced from 12% to above 40%, aerobic biodegradability of meat processing sludge (given by the ratio of BOD to COD) increased from 8% to 25%. Mesophilic anaerobic digestion tests show that MW-alkaline, as pretreatment step of AD, was suitable to accelerate the hydrolysis stage. Time requirement for achieving 50% organic matter degradation degree decreased by 24%, and biogas yield increased by 48%, respectively. It was also verified that change of dielectric parameters has a good correlation with DD and biodegradability indicators, what enable to develop in line and real time estimation of biodegradability during microwave pretreatment process step.

Keywords

sludge, microwave, pretreatment, disintegration, biodegradability

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