



## Microwave–alkaline treatment for enhanced disintegration and biodegradability of meat processing sludge

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### ABSTRACT

An increasing number of studies has been focused on the investigation of sludge treatment by microwave irradiation alone or combined with chemical methods. Besides the promising results for municipal sludge processing, the applicability of microwave pre-treatment methods is less evaluated and verified for food industry sludge, especially in continuous-flow operations. Therefore, our work is aimed at the investigation of microwave–alkaline treatment for meat processing sludge using disintegration degree (DD) and aerobic biodegradation index (BDI) as control parameters. Our results verified that irradiated microwave energy ( $E_s$ ), calculated from microwave power and flow rate applied during continuous flow microwave process, and alkaline dosage also have a significant effect on disintegration degree and aerobic biodegradability. With microwave–alkaline treatment the DD was improved to over 45% from the initial value of 12%. The change of BDI cannot be described by the same tendency that obtained for DD. Due to the combined treatment, the BDI was improved from 7.8% to 25%, but over a certain value of  $E_s$  and alkaline dosage, the aerobic biodegradability starts to worsen. Measurement of dielectric constant has been proved suitable to detect the physicochemical changes in sludge structure due to microwave–alkaline treatment, and behaviour of dielectric constant as a function of  $E_s$  and alkaline dosage show a tendency similar to that which obtained for DD. These preliminary results enable the further and deeper analysis of dielectric parameters of sludge in order to find suitable real-time and/or in-line method to estimate the disintegration efficiency during sludge treatment processes.

**Keywords:** Sludge; Microwave; Alkaline treatment; Disintegration; Biodegradability; Dielectric constant

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