



ENHANCING AND MONITORING THE ANAEROBIC DIGESTION OF WASTEWATER SLUDGE

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ABSTRACT

Nowadays, protecting our environment and researching renewable energy sources play an increasingly important role. Anaerobic fermentation can lower the organic content of the wastewater sludge while a renewable energy source – biogas – is produced at the same time. During our work we examined two monitoring techniques – the monitoring of dielectric properties and absolute viscosity – in order to determine if these techniques are suitable for identifying and monitoring the different phases of the anaerobic fermentation of the sewage sludge. Furthermore, microwave pre-treatment was used on the wastewater sludge to examine its effect on anaerobic digestion, and co-fermentation experiments were also carried out. Our experimental results show that the microwave irradiation can intensify the total biogas yield by 15%, and it can reduce the viscosity of the fermentation media by 13%. Moreover, it has been confirmed in case of the results of co-fermentation experiments that the optimal setting of the C/N ratio in sludge samples mixed with plant by-products could increase the amount of the maximum biogas yield. To summarise, dielectric and rheological measurements are capable of monitoring the anaerobic fermentation, because there is a correlation among dielectric parameters, biogas yield and absolute viscosity of the fermentation media. Changes in dielectric parameters and absolute viscosity show similar trends, which can be explained by the connection with biogas production.

Keywords: anaerobic fermentation, biogas, dielectric properties, viscosity, microwave irradiation