ENHANCING THE BIODEGRADABILITY OF MEAT INDUSTRY SLUDGE WITH METAL NANOPARTICLES COUPLED MICROWAVE IRRADIATION

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ABSTRACT

Our study examined the impact of combining iron oxide nanoparticles with microwave pretreatment on the anaerobic digestibility and soluble chemical oxygen demand (SCOD) of meat industry sludge. We aimed to determine if microwave pretreatment could enhance biogas production by making organic compounds more biologically available. Findings reveal that this combination significantly enhances SCOD, biogas production rate, and total biogas volume without adversely affecting biomethane quality. Additionally, examining the dielectric properties of the sludge (dielectric constant and loss factor at 500 MHz) showed a strong correlation with SCOD changes ($r=0.9942$, $R^2>0.99$), presenting a new method for assessing pretreatment effectiveness.

Keywords: sludge utilization, biogas production, microwave pretreatment, magnetic nanoparticles

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