Two-stage mesophilic anaerobic digestion from waste activated sludge enhanced by low-temperature thermal hydrolysis

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\textbf{ABSTRACT}

Two-stage mesophilic anaerobic digestion of waste activated sludge was conducted to enhance methane production by low-temperature thermal hydrolysis. Two steady stages were evaluated: the first acidogenic stage was operated at sludge retention times of 2 d, and the second methanogenic stage was controlled at hydraulic retention times of 8 d. Thermal hydrolysis results showed that more chemical oxygen demand, proteins and carbohydrates were released from sludge as temperature increased from 50 to 120°C. Protein-like substances were major components from three-dimensional (3D) excitation–emission matrix analysis, and their fluorescence intensities were matched with temperatures. Sludge extracellular structure was disintegrated from scanning electron microscope analysis when the temperature was beyond 80°C. The volatile fatty acids (VFAs) and methane production had positive relation to the soluble organic matters after low-temperature hydrolysis. About 100°C was the suitable temperature for sludge digestion, and corresponding VFAs and biogas productions were 1,672 mg/L and 123 mL/gVSS, respectively.

\textit{Keywords:} Waste activated sludge; Mesophilic anaerobic digestion; Thermal hydrolysis; Methane production

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