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Improved process performance of the acidification phase in a two-stage anaerobic digestion of complex organic waste: effects of an iron oxide-zeolite additive

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Abstract:

Improvement of the acidification phase is an attractive alternative to break through the rate-limiting step in the two-phase anaerobic digestion of complex organic wastes. An additive named iron oxide-zeolite was introduced into the acidification phase at mesophilic and room temperature. By virtue of the additive supplemented, significantly improved hydrolysis/fermentation in regard to higher soluble chemical oxygen demand (sCOD) concentration (21.53-27.30%) and better lignocellulosic degradation at both temperatures has been obtained. Furthermore, an optimized volatile fatty acid formation type (more favorable acetate and less undesired propionate) has been achieved. The favorable environment of the acidogenic effluent facilitated the subsequent methanogenesis. The increased microbial community abundances of some hydrolytic, acetogenic and cellulolytic bacteria may provide the explanation on the promoted hydrolysis/acidogenesis. The results in this study suggested that supplementation of the iron oxide-zeolite into the acidification phase is a valuable alternative to improve hydrolysis/acidogenesis of the complex substrates.

Keywords: Complex organic wastes; anaerobic digestion; Acidification phase; Additive;

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