Performance improvement in a two-stage thermophilic anaerobic membrane bioreactor using PVA-gel as biocarrier

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Received 16 July 2013; Accepted 28 April 2014

ABSTRACT

This study focused on the effect of polyvinyl alcohol (PVA)-gel as biocarrier on total volatile fatty acid (VFA) production in a two-stage thermophilic anaerobic membrane bioreactor consisting of a hydrolytic reactor with PVA-gel addition followed by a methanogenic reactor and a microfilter (0.1 μm) operating continuously under external semi-dead-end mode at 55°C. The reactor was fed with tapioca starch-based synthetic wastewater at two organic loading rates (OLR) of 6 and 8 kg COD/m³d. Hydrolytic reactor with PVA-gel showed an increasing in total VFA generation and enhances methane production at OLR 6 kg COD/m³d. Acetic acid and n-butyric acid were observed as the predominant components without propionic acid accumulation. The operational performance of the system was monitored by COD removal efficiency and methane production rate. High COD removal efficiency at 89–92% with a methane generation rate 1.5–1.9 Lmethane/Lreactor.d was observed throughout the experimental period. However, membrane fouling was one of the limiting factors in this study. Membrane fouling investigations indicated that the major fouling in thermophilic anaerobic membrane bioreactors was reversible organic fouling caused by extracellular polymeric substances.

Keywords: PVA-gel; Biocarrier; Membrane fouling; Thermophilic anaerobic membrane bioreactor; Particulate wastewater

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Presented at 2013 International Environmental Engineering Conference and Annual Meeting of the Korean Society of Environmental Engineers (IEEC 2013), Seoul, Korea, June 11–13, 2013

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