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Short Communication

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Enhanced volatile fatty acid production from excess sludge by combined free nitrous acid and rhamnolipid treatment

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Abstract

VFA production from excess sludge (ES) was greatly enhanced by a low-cost and high-efficient treatment: 0.67 mg/L free nitrous acid (FNA) pretreatment combined with 0.04 g/g TSS rhamnolipid (RL) addition (FNA+RL), which significantly shortened fermentation time to 3 days and increased VFA production to 352.26 mg COD/g VSS (5.42 times higher than raw ES). Propionic and acetic acids were the two leading components (71.86% of the total VFA). Mechanism investigation manifested FNA+RL improved the biodegradability of ES, achieved positive synergetic effect on solubilization, hydrolysis and acidification efficiencies, and inhibited methanation. Microbial community distribution further explained the above phenomena. The bacteria related to polysaccharides/protein utilization and VFA generation, including *Clostridium*, *Megasphaera* and *Proteiniborus*, were mainly observed in FNA+RL, whereas gas-forming bacteria *Anaerolineae* and acid-consuming bacteria *Proteobacteria* were assuredly suppressed. Besides, *Propionibacterineae* associated with propionic acid generation was exclusively enriched in sole RL and FNA+RL.

Keywords: Excess sludge; Volatile fatty acid; Free nitrous acid; Rhamnolipid; Pretreatment.

1 Introduction

Activated sludge technology has taken an irreplaceable role in wastewater

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