Anaerobic digestion of sludge filtrate assisted by symbionts of short chain fatty acid-oxidation syntrophs and exoelectrogens: Process performance, methane yield and microbial community

Sludge filtrate is a kind of special organic wastewater generated from hydrothermally pretreated sewage sludge. The efficient treatment of sludge filtrate can promote the development of sludge recycling technology. Herein, the anaerobic baffled reactor (ABR) assisted by symbionts of short chain fatty acid-oxidation syntrophs (SFAS) and exoelectrogens was applied to treat the sludge filtrate. The influence of fermentation temperature and promotion of methanogenesis via symbionts were focused. The results showed that the COD removal efficiency and methane yield of the ABR system assisted by symbionts at 35 °C (R3) were 11.7% and 11.0% higher than the one at 55 °C (R2), respectively. And the COD removal efficiency and methane yield of the R2 system were 9.1% and 12.9% higher than the traditional ABR system at 55 °C (R1), respectively. Large abundances of exoelectrogens such as Thermincola and Geobacter were found in the R2 and R3 systems, respectively. Moreover, ample Syntrophobacter, Syntrophomonas and Methanobacterium were detected in both R2 and R3 systems. The present research revealed the importance of SFAS, exoelectrogens and hydrogenotrophic methanogens for the improvement of methanogenesis. Besides, the mesophilic condition is conducive to enhancing the methanogenesis rate of sludge filtrate.