Hydrolysis and acidification of waste activated sludge enhanced by zero valent iron-acid pretreatment: effect of pH

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ABSTRACT

Zero valent iron (ZVI) is the most commonly applied as a reactive media in remediation of wastewater treatment. In this work, a novel ZVI-acid pretreatment was expected to improve the anaerobic fermentation of waste activated sludge (WAS). The experimental results showed that pH significantly affected the function of ZVI, and the maximum SCOD, soluble protein, and polysaccharides were observed at pH 3.0 in the presence of ZVI. At fermentation time of 4 d, the maximum total volatile fatty acids (VFAs) was 900 mg/L with ZVI dosage of 1 g/g DS, which was 1.53-fold higher than the blank test. The analysis of VFAs composition showed that acetic, propionic, and valeric acids were the three main products at any ZVI dosage, and ZVI dosing contributed to a greater proportion of acetic acid and a lesser proportion of propionic acid. Meanwhile, mechanism investigations showed that the hydrolysis of soluble substrate as well as acidification of hydrolysate was apparently enhanced by ZVI dosing. These results suggested that the ZVI-acid pretreatment was helpful to accelerate and improve anaerobic acidogenesis of WAS.

Keywords: Waste activated sludge; Anaerobic fermentation; Hydrolysis; Acidification; Volatile fatty acids; Zero valent iron