# Effects of sulfate and ammonia concentrations of the high solid food waste on the performance of the anaerobic digestion for methane generation

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**Background：**

Population growth and rising living standards inevitably increase the production of food waste. Food waste usually has a high solid content (TS=20%~30%), so high solid anaerobic digestion (HS-AD) as a sustainable food waste treatment method has received more and more attention (Nghiem, et al. 2017). At present, research on wet anaerobic digestion has made some achievements, but HS-AD is not the same with it (Rocamora, et al. 2020). Therefore, it is particularly necessary to further explore the key driving factors affecting the methane production performance of HS-AD (Zan and Hao 2020).

**Abstract:**

In order to observe the inhibitors of HS-AD during the organic wastes treatment in the actual process，semi-continuous horizontal flow HS-AD system were successfully started-up (TS=21.7~14.1%, OLR=9.765 kgVS·$m^{-3}$·$d^{-1}$) .The experimental results demonstrated that the accumulation of the ammonia nitrogen and sulfate restricted the biogas production, and a solid content of more than 20% will hinder the escape of biogas. Subsequently, nine HS-AD reactors (reactor volume of 500 mL) with varied sulfate concentrations (400, 800, 1200, 1600,3500 mg/L) and ammonia nitrogen concentrations (2000, 3500, 4500, 6500 mg/L) were constructed and operated under the temperature of 37±1 ℃, using synthetic food wastes as the substrate and the anaerobic digested sludge as the inoculum. The performance was investigated, using the substrates as above mentioned, via the detection of the parameters of methane productivity, TC, TOC, TN, SCOD, ammonia nitrogen, pH and volatile fatty acids (VFAs).

In overall, the solid-liquid distribution of C and N in the HS-AD has no significant correlation with the concentration of ammonia nitrogen and sulfate. By contrast, the HS-AD system can even tolerate as high as 3500-4500 mg/L ammonia nitrogen concentration, demonstrated that the organic system with high solid content is more tolerant to high ammonia nitrogen concentration. The concentration of 800 and 1200 mg/L sulfate would significant enhance the methane production, might be closely related to sulfate stimulation of SRB to improve the degradation of propionate to produce acetate. Therefore, regulating sulfate is a potential strategy for improving methane production efficiency.

**References**

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