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EFFECT OF GLYCEROL ON BIOMETHANE PRODUCTION AND VOLATILE ORGANIC COMPOUNDS IN ANAEROBIC DIGESTION OF URBAN SEWAGE SLUDGE

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Abstract

The glycerol from biodiesel industry is considered an ideal co-substrate for the anaerobic digestion and can boost biogas yields. However, in order to keep a stable digestion process, the amount of glycerol added should be controlled to avoid the risk of organic overloading. The aim of this work was to evaluate the glycerol effect used as a co-substrate in order to boost biogas production during the anaerobic treatment of urban sewage sludge in a separated, two-phase anaerobic system.
The first phase was used for hydrolysis, acidification and acetogenesis of wastewater sludges, whereas the second one was employed for methanogenesis. Soluble chemical oxygen demand (SCOD), total suspended solids (TSS), volatile suspended solids (VSS), VFA, total alkalinity (TA), pH and biogas production were monitored. The effect of glycerol was also examined on the composition of volatile organic compounds (VOC) by head-space solid phase microextraction combined with gas chromatography–mass spectrometry (HS-SPME-GC-MS) and on the sludges morphology by scanning electron microscopy (SEM). All results were compared with a methanogenic digester without glycerol.
Glycerol addition boosted biogas yields and considerably changed the VOC composition, while no trace of volatile fatty acids (VFA) was found in the digestate. The appearance of different volatiles amines suggested that the methane formation seems to take place through the amines fermentative degradation instead of the acetate one. In conclusion, the utilization of glycerol, a residue of the biodiesel industry, can be useful to improve methane production in wastewater treatment plants with a sludge anaerobic digestion unit.