Impacts of iron oxide and titanium dioxide nanoparticles on biogas production: Hydrogen sulfide mitigation, process stability, andprospective challenges. (Journal of Environmental Management,240, 160-167, 0301-4797/ © 2019, Elsevier Ltd.(2

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Abstract:

Anaerobic digestion for biogas production is one of the most used technology for bioenergy. However, the adoption of nanoparticles still needs further studies. Therefore, this study was designed to examine the effect of metal oxide nanoparticles (MONPs) at four different concentrations in two different combinations, 20 (R1) and 100 (R2) mg/L for Fe2O3, 100 (R3) and 500 (R4) mg/L for TiO2, and a mixture of Fe2O3 and TiO2 at rates of 20, 500 (R5) and 100, and 500 (R6), on hydrogen sulfide (H2S) mitigation, biogas, and methane (CH4) yield during the anaerobic digestion of cattle manure (CM) using an anaerobic batch system. The results showed that H2S production was 2.13, 2.38, 2.37, 2.51, 2.64, and 2.17 times lower than that of the control (R0), respectively, when the CM was treated by the aforementioned MONPs. Additionally, biogas and CH4 production were 1.09 and 1.105, 1.15 and 1.191, 1.07 and 1.097, 1.17 and 1.213, 1.10 and 1.133, and 1.13 and 1.15 times higher than those of R0 when R1, R2, R3, R4, R5, and R6 were supplemented with MONPs, respectively. The highest specific production of biogas and CH4 was 336.25 and 192.31 mL/gVS, respectively, which was achieved by R4 supplemented with 500 mg/L TiO2 NPs, while the corresponding values in the case of R0 were 286.38 and 158.55 mL/gVS

Keywords:

Metal oxide nanoparticles Hydrogen sulfide Biogas Methane Anaerobic digestion Manure treatmen

Published In:

Journal Of Environmental Management,240, 160-167, 0301-4797/ © 2019, Elsevier Ltd. (2019. - ادارة مجلة فى منشور البحث
البيئة العالمية مارس لعام2019 م التابعة لهيئة نشر السيفيار العلمية. , 240 , 160-167