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Factors affecting on hythane bio-generation via anaerobic digestion of mono-ethylene glycol contaminated wastewater: inoculum-to-substrate ratio, nitrogen-to-phosphorus ratio and pH

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Abstract

This study aims to assess the effect of inoculum-to-substrate ratio (ISR) and nitrogen-to-phosphorus balance on hythane production from thermophilic anaerobic decomposition of mono-ethylene glycol (MEG) contaminated wastewater. ISRs ranging from 2.65 to 13.23 gVSS/gCOD were employed, whereas the tested N/P ratios varied from 4.6 to 8.5. Maximum methane and hydrogen yields (MY and HY) of 151.86 ± 10.8 and 22.27 ± 1.1 mL/gCOD_{initial} were achieved at ISRs of 5.29 and 3.78 gVSS/gCOD, respectively. HY increased 1.45-fold by decreasing N/P from 8.5 to 4.6, while MY improved 1.6-fold by increasing N/P from 4.6 to 5.5. Methane production was strongly influenced by initial NH₄-N, compared to initial PO₄-P. Optimal HY of 47.55 mL/gCOD_{initial} was achieved at pH 5.0 and ISR of 3.78 gVSS/gCOD using thermal-treated sludge. Three-dimensional regression model was applied for the combined effect of initial MEG, NH₄-N and PO₄-P on hythane

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