



Addition of ferric chloride in anaerobic digesters to enhance sulphide removal and methanogenesis

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ABSTRACT

A feasibility study on the addition of ferric chloride (FeCl_3) as selective regulator to reduce the sulphide reduction activities of sulphate reducing bacteria (SRB) in anaerobic digester was investigated. A lab-scale up-flow anaerobic sludge blanket (UASB) fed with synthetic sulphate enriched wastewaters were operated continuously for 56 d. The influent sulphate concentrations with an addition of potassium sulphate (K_2SO_4) were operated at corresponding COD/ SO_4^{2-} ratios of 5.3, 2.5 and 1.3, respectively. An amount of FeCl_3 at dosages of 10.2, 22.2 and 44.5 mM were added on days 66, 86 and 108, respectively (i.e. 8–10 d after each COD/ SO_4^{2-} ratio was introduced). Results showed that sCOD removal efficiencies averaged at 78%, 80% and 70%, respectively while methane yield averaged at 0.35, 0.32 and 0.27 L CH_4 . gCOD_{destroyed}⁻¹ when FeCl_3 dosage were added at 10.2, 22.2 and 44.5 mM, respectively. Furthermore, the scanning electron microscopy (SEM) examinations demonstrated that UASB operated at COD/ SO_4^{2-} ratio of 1.3 were dominated by several filamentous rod-shaped bacteria attached to the structural matrix of the digesting sludge as compared to COD/ SO_4^{2-} ratio of 2.5. However, when UASB was supplemented with FeCl_3 at dosages of 22.2 mM and 44.5 mM, the sludge contained no rod-shape bacterium and the morphology of sludge showed the presence of iron sulphide precipitation.

Keywords: Upflow anaerobic sludge blanket; Sulphate-reducing bacteria (SRB); Ferric chloride (FeCl_3); COD to sulphate ratio (COD/ SO_4^{2-}); Methane productivity

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