

A Study on the Effect of Cod to Sulphate Ratio on Performance of Lab Scale Upflow Anaerobic Sludge Blanket Reactor

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Abstract : Anaerobic sulphate reduction has the potential for being effective and economically viable over conventional treatment methods for the treatment of sulphate-rich wastewater. However, a major challenge in anaerobic sulphate reduction is the diversion of a fraction of organic carbon towards methane production and some minor problem such as odour problems, corrosion, and increase of effluent chemical oxygen demand. A high-rate anaerobic technology has encouraged researchers to extend its application to the treatment of complex wastewaters with relatively low cost and energy consumption compared to physicochemical methods. Therefore, the aim of this study was to investigate the effects of COD/SO₄²⁻ ratio on the performance of lab scale UASB reactor. A lab-scale upflow anaerobic sludge blanket (UASB) reactor was operated for 170 days. In which first 60 days, for successful start-up with acclimation under methanogenesis and sulphidogenesis at COD/SO₄²⁻ of 18 and were operated at COD/SO₄²⁻ ratios of 12, 8, 4 and 1 to evaluate the effects of the presence of sulfate on the reactor performance. The reactor achieved maximum COD removal efficiency and biogas evolution at the end of acclimation (control). This phase lasted 53 days with 89.5% efficiency. The biogas was 0.6 L/d at (OLR) of 1.0 kg COD/m³d when it was treating synthetic wastewater with effective volume of reactor as 2.8 L. When COD/SO₄²⁻ ratio changed from 12 to 1, slight decrease in COD removal efficiencies (76.8-87.4%) was observed, biogas production decreased from 0.58 to 0.32 L/d, while the sulfate removal efficiency increased from 42.5% to 72.7%.

Keywords : anaerobic, chemical oxygen demand, organic loading rate, sulphate, up-flow anaerobic sludge blanket reactor

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