Carbonaceous organics removal kinetics in an upflow anaerobic sludge blanket (UASB) reactor treating physico-chemically pre-treated textile wastewater

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ABSTRACT

In the present study, physico-chemically pre-treated textile wastewater with a residual chemical oxygen demand (COD) of 780 ± 10 mg L⁻¹ was treated using a lab-scale upflow anaerobic sludge blanket (UASB) reactor at variable HRTs of 30.8 to 8 h, and organic loading rates (OLRs) of 0.62–2.4 kg COD m⁻³ d⁻¹. Using a new composite coagulant at dosage of 800 mg L⁻¹ for pre-treatment, more than 99% of colour was removed from the feeding influent to UASB reactor. The optimum OLR was found as 0.95 kg COD m⁻³ d⁻¹ at which maximum COD reduction (98%) was achieved. Modified Stover-Kincannon, Grau second-order, Monod, Haldane and Contois models were applied to evaluate the carbonaceous substrate removal kinetics inside the UASB reactor. The experimental results of this analysis revealed that modified Stover-Kincannon and Grau second-order kinetics were suitable for predicting the performance and to estimate the kinetic coefficients of UASB reactor.

Keywords: Composite coagulant; Kinetic modelling; Textile wastewater; UASB reactor

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