

Decolorization of methyl orange using upflow anaerobic sludge blanket (UASB) reactor-An investigation of co-substrate and dye degradation kinetics

Abstract

Decolorization of a synthetic wastewater containing Methyl Orange (MO) azo dye was performed in an upflow anaerobic sludge blanket (UASB) reactor. Color removal efficiencies approaching 94, 90 and 96% were obtained with influent MO concentrations of 50, 100 and 150 mg l⁻¹ respectively. COD removal decreased with respect to the increasing of color concentration. Maximum COD removal was attained 69% in 50 mg l⁻¹ of MO. Cleavages of azo bond tends to the accumulation of aromatic amines which contributed COD in the effluent. Zero-, first-, and second-order reaction kinetics were used to find out the suitable COD removal and decolorization kinetics. The COD removal process was suitable to second-order reaction kinetic, and the degradation of MO approximates was suitable to the first-order kinetic model. The regression coefficient (R²) for both decolorization and COD degradation was around 0.9 which ensures the high-degree linear relationship between the concentration and time.

Keywords

Azo dye; Color removal; Kinetic model; Methyl Orange; UASB reactor