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Immobilized bioprocess for organic carbon and nitrogen removal

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ABSTRACT

The immobilized bioprocess (IBP) was investigated for the removal of organic carbon and ammonia nitrogen from wastewater. Two wastewaters (a food industry wastewater and a composite industrial wastewater) were investigated, one containing high concentration (820–1300 mg/l) and the other medium concentration (250–450 mg/l) of chemical oxygen demand (COD). Three mixed liquor suspended solids (MLSS) (3000, 5000, and 9000 mg/l) and two hydraulic retention times (HRT) (12 h and 24 h) were employed representing different surface loading and volume loading factors. IBP provides high sludge retention time (SRT), enabling improved removal of COD and ammonia nitrogen. The results showed 78–93% and 83–96% removals of soluble COD (SCOD) and ammonia (NH_4^+–N), respectively, from the food industry wastewater, when the surficial removal rate and volumetric removal rate in the IBP were 0.011–0.056 kg COD/m^2-d and 2.3–12 kg COD/m^3-d, respectively. For the composite industrial wastewater, removal of SCOD and NH_4^+–N were 53–80% and 38–69%, respectively, when the surficial removal rate and volumetric removal rate were 0.0048–0.016 kg COD/m^2-d and 1.0–3.4 kg COD/m^3-d, respectively. The results further show stable removals of COD and NH_4^+–N, albeit decreasing with decreasing HRTs and MLSS. IBP facilitates simple operation and good effluent quality without requiring sludge recycling.

Keywords: Immobilized bioprocess; Carbon and ammonia nitrogen removal; Surface loading; Volume loading; Hydraulic retention time; Sludge retention time

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