Combined Fenton-like oxidation and aerobic MBBR biological processes for treatment of the wastewater of detergent industries

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Abstract

Surfactant is one of the most important compounds widely used in the formulation and structure of detergents all over the world. In this study, we investigated the combined Fenton-like oxidation and aerobic moving bed biofilm reactor (MBBR) biological processes for treatment of the wastewater of detergent industries. The average chemical oxygen demand (COD) and linear alkylbenzene sulfonate (LAS) in the raw wastewater were 24,039 and 210 mg/L, respectively. The maximum removal efficiencies of the pretreatment and Fenton-like oxidation process for COD and LAS were 95% and 90%, respectively, and the effluent concentrations of COD and LAS were about 1,250 and 100 mg/L, respectively. For MBBR process, in reactor 1 (with lower LAS concentrations) with 36 h hydraulic retention time (HRT), the maximum removal efficiencies were found to be 94.20% and 99.99% for the influent COD and LAS, respectively ($R^2 = 0.93$ and $p < 0.05$ and $R^2 = 0.92$ and $p < 0.05$). Also, for reactor 2 (with higher LAS concentrations), in the same condition with 36 h HRT, the maximum removal efficiencies were 93.41% and 95% for the influent COD and LAS, respectively ($R^2 = 0.92$ and $p < 0.05$ and $R^2 = 0.84$ and $p < 0.05$). This investigation shows that Fenton-like oxidation process, in combination with MBBR process, can provide the local effluent discharge standard for detergent industries.

Keywords: Detergent; Linear alkylbenzene sulfonate; Fenton-like oxidation; MBBR process; Industrial wastewater

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