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Comparison of sequencing batch reactor (SBR) and granular activated carbon-SBR (GAC-SBR) systems on treatment textile wastewater containing basic dye

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Abstract

Efficiencies of SBR and granular activated carbon (GAC)-SBR systems with textile industrial wastewater (TIW) containing basic dyes (Basic Red 46 (BR46) and Basic Blue 41 (BB41)) at hydraulic retention times (HRTs) of 3.0, 5.0, and 7.5 d were investigated. The results showed that the basic dyes could be adsorbed onto bio-sludge but the adsorption yield depended on the molecular structure and weight of the basic dye.

BR46 could be adsorbed onto the bio-sludge with higher yield than BB41. Also, the color adsorption yield of living bio-sludge was 22% higher than that of autoclaved bio-sludge (thermally treated bio-sludge). Moreover, the bio-sludge from a domestic wastewater treatment plant showed higher color adsorption yield than the bio-sludge from a textile wastewater treatment plant. The GAC-SBR system was more suitable than the SBR system to treat TIW. The highest color, COD, BOD_5, total Kjeldahl nitrogen (TKN), and total nitrogen (TN) removal efficiencies of the GAC-SBR system with TIW at HRT of 5 d (organic loading of 0.22 kg BOD_5/m^3 d and dye loading of 0.02 kg/m^3 d) were 68.3 ± 3.2, 88 ± 1, 90 ± 1, 80.6 ± 6.8, and 55.9 ± 3.2%, respectively. Moreover, its removal efficiency could be increased by adding organic matter (glucose). The color, COD, BOD_5, TKN, and TN removal efficiencies with TIW containing 0.87 g/L glucose at HRT of 5.0 d (organic loading of 0.25 kg BOD_5/m^3 d) increased up to 80.0 ± 0.7, 97 ± 1%, 98 ± 0, 83.3 ± 0.0, and 58.9 ± 0.2%, respectively. Moreover, it was the first study where nitrogen removal bacteria (nitrifying and denitrifying bacteria) were the main bacteria in basic dyes removing mechanism.

Keywords:

Adsorption Basic dye Bio-sludge Granular activated carbon

Sequencing batch reactor (SBR) system Textile industrial wastewater

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Related Research Data

Treatability studies with granular activated carbon (GAC) and sequencing batch reactor (SBR) system for textile wastewater containing direct dyes