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ANAEROBIC DEGRADATION OF DYES AZO DIRECT BLUE 71 AND REACTIVE BLACK 5 UNDER DIFFERENT CONDITIONS

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Abstract

In this study, the degradation of the Direct Blue 71 (DB71) - a trisazo dye and Reactive Black 5 (RB5) - a double azo dye was evaluated under three environmental conditions with respect to the presence of electron acceptors: sulfate, nitrate, and under methanogenic condition, in anaerobic batch reactors with 500 mL reaction volume. The best color removal efficiencies for RB5 dye, with an initial concentration of 52 mg/L was 94% in the presence of sulfate as electron donor. For DB71 dye, the best color removal efficiency was 99% for an initial concentration of 77 mg/L, under the methanogenic condition. The highest average removal speeds for DB71 dye were 0.16±0.02 $hours^{-1}$ and for RB5 dye was 0.15±0.02 $hours^{-1}$, observed concurrently with sulfate reduction condition. For RB5, the higher conversion speed, color and organic matter removal, and methane production in the sulfidogenic condition suggests that the highest presence of sulfate in its structure of the dye favored the activity of the sulfate-reducing bacteria. The maximum production of methane was 8.9 µmol/L, observed in reactors with RB5 with sulfate reduction. For reactors with DB71, the accumulated methane production was 6.9 µmol/L, in both sulfate and methanogenic conditions. In this way, the reaction condition containing sulfate in the medium favored the anaerobic biotransformation of direct and reactive azo dyes.

Key words: anaerobic conditions, denitrifying condition, methanogenesis, sulfetogenesis, toxic compounds

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