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Denitrification of drinking water using a hybrid heterotrophic/autotrophic/BAC bioreactor

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ABSTRACT

The performance of a hybrid heterotrophic/autotrophic/BAC bioreactor (HHABB) for denitrification of drinking water was studied in continuous mode for several months to determine the optimal conditions. The HHABB was consisted of three compartments: ethanol heterotrophic part (EH-part), sulfur autotrophic part (SA-part) and BAC-part (including anoxic and aerobic sections). The experiments were conducted at six runs with NO_3^- loading rates ranged from 0.36 to 1.45 kgN $m^{-3}\,d^{-1}$, C:N ratios 0.53 and 0.70 and approximately constant NO_3^- concentration of 30 mgN l^{-1}. At lower NO_3^- loading rates (0.36 and 0.72 kgN $m^{-3}\,d^{-1}$), the C:N ratio 0.53 provided high denitrification efficiencies (96–99%) with very low effluent DOC and trihalomethane formation potential (THMFP) concentrations of 0.33–0.50 mgC l^{-1} and 26–41 μg l^{-1}, respectively. In contrast, at NO_3^- loading rate 1.07 kgN $m^{-3}\,d^{-1}$, an increase in C:N ratio to 0.70 was required to achieve suitable results. The aerobic BAC-part showed suitable efficiency in the oxidation of NO_2^- and removal of DOC and THMFP. This study predicted that the HHABB without the anoxic BAC-part could be as a feasible alternative for NO_3^- removal from drinking water at full-scale.

Keywords: Heterotrophic denitrification; Autotrophic denitrification; BAC; Drinking water NO_3^- loading rate; C:N ratio

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