



## Simultaneous removal of nitrate and aniline from groundwater by cooperating heterotrophic denitrification with anaerobic ammonium oxidation

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### ABSTRACT

To investigate the performance of cooperating heterotrophic denitrification (HD) with anaerobic ammonium oxidation (ANAMMOX) in removing nitrate and aniline simultaneously from organic limitation combined contamination groundwater, batch cultures, and flow column experiments were constructed. The two experimental results showed that it was feasible to remove nitrogen and carbon simultaneously by indigenous HD and ANAMMOX bacteria existing ubiquitously in groundwater aquifer medium, and the cooperation effect was significant. Batch cultures results demonstrated that high nitrate, aniline, and COD removal efficiency (over 79.0, 96.6, and 69.6%) were achieved at selected C/N of 0.3, 0.46, and 0.91 conditions, and the maximum activities of HD and ANAMMOX reached to 25.22 mg/(d·l), 5.54 mg/(d·l), and 7.06 mg/(d·l) after 150 days inoculation. As such, nitrate, aniline, and COD removal efficiency were equal to 99.8, 99.9, and 89.5% in continuous flow column with nitrate 1,000 mg L<sup>-1</sup> and aniline 50 mg L<sup>-1</sup>. The variations of NO<sub>2</sub><sup>-</sup>-N, NH<sub>4</sub><sup>+</sup>-N, pH, and EC could indicate HD and ANAMMOX coupling characteristics accurately. Moreover, carbon source utilization efficiency was dramatically improved by the synergetic effect of HD and ANAMMOX, as ANAMMOX could use CO<sub>2</sub> and other inorganic carbon produced by HD process, which confirmed its great potential and feasibility to develop energy-saving and high efficiency *in situ* technology in the remediation of complex polluted groundwater.

*Keywords:* Nitrate and aniline; HD; ANAMMOX; Synergistic effect; Groundwater

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