

Challenges in using allylthiourea and chlorate as specific nitrification inhibitors - DTU Orbit (09/11/2017)

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Allylthiourea (ATU) and chlorate (ClO₃⁻) are often used to selectively inhibit nitritation and nitratation. In this work we identified challenges with use of these compounds in inhibitory assays with filter material from a biological rapid sand filter for groundwater treatment. Inhibition was investigated in continuous-flow lab-scale columns, packed with filter material from a full-scale filter and supplied with NH₄⁺ or NO₂⁻. ATU concentrations of 0.1-0.5 mM interfered with the indophenol blue method for NH₄⁺ quantification leading to underestimation of the measured NH₄⁺ concentration. Interference was stronger at higher ATU levels and resulted in no NH₄⁺ detection at 0.5 mM ATU. ClO₃⁻ at typical concentrations for inhibition assays (1-10 mM) inhibited nitratation by less than 6%, while nitritation was instead inhibited by 91% when NH₄⁺ was supplied. On the other hand, nitratation was inhibited by 67-71% at 10-20 mM ClO₃⁻ when NO₂⁻ was supplied, suggesting significant nitratation inhibition at higher NO₂⁻ concentrations. No chlorite (ClO₂⁻) was detected in the effluent, and thus we could not confirm that nitritation inhibition was caused by ClO₃⁻ reduction to ClO₂⁻. In conclusion, ATU and ClO₃⁻ should be used with caution in inhibition assays, because analytical interference and poor selectivity for the targeted process may affect the experimental outcome and compromise result interpretation.

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Authors: Tatari, K. (Intern), Gülay, A. (Intern), Thamdrup, B. (Ekstern), Albrechtsen, H. (Intern), Smets, B. F. (Intern)

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