Novel pre-treatments to control bromate formation during ozonation - DTU Orbit
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Worldwide water shortage increase and water quality depletion from microbial and chemical compounds, pose significant challenges for today's water treatment industry. Both the development of new advanced oxidation technologies, but also the enhancement of existing conventional technologies is of high interest. This study tested improvements to conventional ozonation that reduce the formation of the oxidation-by-product bromate, while maintaining the effectiveness for removal emerging contaminants (atrazine). MnO₄⁻, ClO₂⁻, ClO₂, ClO⁻, CH₃COOO⁻, HSO₅⁻ or S₂O₈⁻² with NH₄⁺ were tested as pre-treatments to ozonation of ground water. Each oxidant and NH₄⁺ were added in a single stage or separately prior to ozonation. To the best of our knowledge, this is the first study that has tested all the above-mentioned oxidants for the same water matrix. Based on our results, the most promising pre-treatments were MnO₄⁻-NH₄⁺, ClO₂⁻-NH₄⁺ and ClO₂-NH₄⁺. MnO₄⁻-NH₄⁺ was the only pre-treatment that didn't inhibit atrazine removal. When compared with the previously proposed Cl₂/NH₄⁺ pre-treatment, MnO₄⁻ + NH₄⁺ was found as effective for preventing BrO₃⁻ formation, while atrazine removal was higher. In addition, MnO₄⁻ + NH₄⁺ can be added in a single stage (compared to the 2 stage addition of Cl₂/NH₄⁺) without causing the formation of potentially harmful chlorination-by-products.