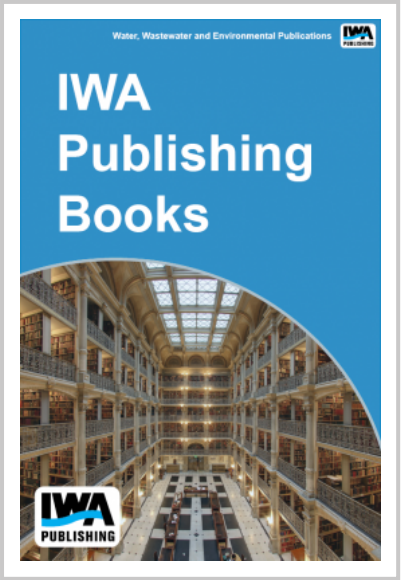
Demonstrating Advanced Oxidation/Biofiltration for Pharmaceutical Removal in Wastewater



This project addresses the need to remove trace organic compounds (TOrC) from wastewater, as well as potentially hazardous oxidation products. The general goal was to evaluate the efficacy of UV-based advanced oxidation (UV/AOP) and UV/AOP in combination with bio-filtration, as an integrated treatment solution to degrade TOrC. The leading hypothesis was that UV/AOP may break down recalcitrant TOrC, generating biodegradable transformation products, which can be further removed by subsequent biofiltration. The first phase of the study, conducted on a bench-scale system, demonstrated the oxidation of iopromide by UV/H2O2 and the increased biodegradability of the transformation products (compared to the parent compound). In the second phase, the transformation of TOrC was examined in different largescale wastewater UV disinfection systems, under photolysis (low and medium pressure UV lamps) and de facto AOP (medium pressure UV lamp + native NO3) conditions.

Results suggested that the transformation of TOrC at UV disinfection fluences (<200 mJ/cm2) were negligible, both under photolysis and AOP conditions. The last phase of the project demonstrated the applicability of different UV/AOPs (UV/H2O2 and UV/NO3) and subsequent biofiltration to remove contaminants from wastewater effluent in a pilot system. Results showed that, at high UV fluence (> 750 mJ/cm2), both AOPs could efficiently transform a variety of TOrC, and that the transformation products could be further removed by an aerated biological filter. Furthermore, UV/AOP transformation of the TOrC could be modeled using the probe compound sucralose, from which process efficacy could be calculated.

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