Closing Gaps of Knowledge with respect to Advanced Chemical Oxidation Processes for the Removal of Contaminants of Emerging Concern

GAPS

ΚΟΥΛΤΟΥΡΑ/ΒΕΝΣ/0412/24

Deliverable 11 (D11) of Work Package 5 (WP5):

A report with the results obtained in WP5

Nicosia, September 2015

Brief Summary

This study evaluated the feasibility of UV-C-driven advanced oxidation process induced by sulfate radicals ($SO_4^{-\bullet}$) in degrading erythromycin (ERY) and ethylparaben (EtP) in secondary treated wastewater. The results revealed that 10 mg L^{-1} of sodium persulfate (SPS) can result in rapid and complete antibiotic and paraben degradation within 90 min of irradiation, while both substrates' decay exhibited a pseudo-first-order kinetics pattern under the different experimental conditions applied. ERY and EtP degradation rate was strongly affected by the chemical composition of the aqueous matrix, while the wastewater inherent pH (i.e. pH 8) yielded an increased ERY and EtP degradation rate, compared to that observed under acidic pH conditions. Seven transformation products (TPs) were tentatively elucidated during ERY oxidation, with the 14-membered lactone ring of the ERY molecule being intact in all cases. The structure of the TPs identified in the case of EtP showed preservation of the aromatic ring of the EtP molecule and the structural alterations took place in the ethyl ester chain. The observed phytotoxicity against the tested plant species can potentially be attributed to the dissolved effluent organic matter (dE_fOM) present in wastewater effluents and its associated-oxidation products and not to the TPs generated from the oxidation of ERY and EtP. This study evidences the potential use of the UV-C/SPS process in producing a final treated effluent with lower phytotoxicity (<10%) compared to the untreated wastewater. In the case of ERY, under the optimum experimental conditions, the UV-C/SPS process resulted in total inactivation of ERY-resistant *E. coli* within 90 min.

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