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Degradation of 20 multiclass miropollutans using UV-A activated peroxymonosulfate

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Abstract

In recent years, the concern about the presence of micropollutants in the environment has significantly increased, as conventional wastewater treatments are generally not designed to degrade these compounds efficiently. In this context, advanced oxidation processes (AOPs) have been positioned during the last years as a very promising alternative technology. Specifically, AOPs based on sulfate radicals have been gaining significant interest due to their advantages over those employing the hydroxyl radical.

In this study, the simultaneous degradation of twenty micropollutants commonly found in wastewater has been evaluated. This approach allows to obtain more reliable degradation data than by studying their individual degradation, since the possibility of synergies and/or radical selectivity is considered. To this end, the activation of peroxymonosulfate (PMS) using UV-A (385 nm) emitting LEDs has been studied for the generation of sulfate radicals.

The first optimisation was performed using effluent samples of a wastewater treatment plant spiked with 100 μg L-1 of each target pollutant. At this stage, an optimum concentration of 0.1 mM PMS was determined, achieving an average micropollutant removal of 80%. These conditions were subsequently applied to non-spiked real wastewater. The phytotoxicity tests revealed an increase by 15-30% of plant growth in treated samples, in comparison to those untreated, confirming a toxicity reduction achieved by efficient treatment under study.

Keywords: LEDs, micropollutants, peroxymonosulfate, real wastewater, SR-AOPs, UV-A activation.

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