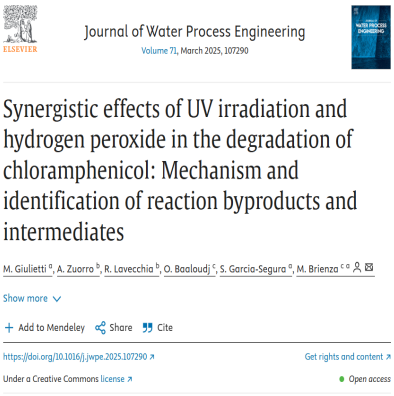


Journal of Water Process Engineering
Volume 71, March 2025, 107290

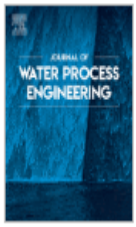
Synergistic effects of UV irradiation and hydrogen peroxide in the degradation of chloramphenicol: Mechanism and identification of reaction byproducts and intermediates

M. Giulietti [a], A. Zuorro [b], R. Lavecchia [b], O. Baaloudj [c], S. Garcia-Segura [a], M. Brienza [c]

Advanced Oxidation for Antibiotic Removal: A Study on Chloramphenicol Degradation

Description

Journal of Water Process Engineering
Volume 71, March 2025, 107290



Synergistic effects of UV irradiation and hydrogen peroxide in the degradation of chloramphenicol: Mechanism and identification of reaction byproducts and intermediates

M. Giulietti [a], A. Zuorro [b], R. Lavecchia [b], O. Baaloudj [c], S. Garcia-Segura [a], M. Brienza [c a]

https://doi.org/10.1016/j.jwpe.2025.107290

Published within the scope of the **PRIMA-SAFE** project, this study in *Journal of Hazardous Materials* presents a systematic approach to identifying pharmaceuticals in reclaimed water that may pose risks when reused for **crop irrigation**. It provides a basis for safer water reuse strategies in Mediterranean agriculture.

Key Findings

- Under optimized conditions (25 mM H?O?, 1240 ?W/cm² UV intensity, pH 6.2), the process achieved **~100% degradation** of a 50 mg/L CHP solution within 60 minutes.

- The combination of UV and hydrogen peroxide generated hydroxyl radicals (•OH), which played a key role in the non-selective degradation of CHP and its by-products.
- A detailed kinetic model and response surface methodology were used to optimize the treatment conditions, supported by experimental validation.
- The study identified multiple transformation by-products and proposed a **comprehensive degradation pathway**, confirming the breakdown of harmful intermediates into low-risk compounds such as carboxylic acids.

Implications

The findings demonstrate that UV/H?O? treatment is a **cost-effective, scalable, and low-input method** for degrading resistant antibiotics like CHP. This process is particularly well suited for **aquaculture and decentralized wastewater systems**, where conventional treatments often fail to eliminate pharmaceutical residues and where the risk of antimicrobial resistance is significant.

Reference

Giulietti M., Zuorro A., Lavecchia R., Baaloudj O., Garcia-Segura S., Brienza M. (2025).
Synergistic effects of UV irradiation and hydrogen peroxide in the degradation of chloramphenicol: Mechanism and identification of reaction byproducts and intermediates.
Journal of Water Process Engineering, 71, 107290.
DOI: 10.1016/j.jwpe.2025.107290

Category

1. Publication

Date Created
2025/05/27
Author
writer