

Comparing UV-based and O₃-Based AOPs for Removal of Emerging Contaminants from Food Processing Digestate Sludge

Authors : N. Moradi, C. M. Lopez-Vazquez, H. Garcia Hernandez, F. Rubio Rincon, D. Brdanovic, Mark van Loosdrecht

Abstract : Advanced oxidation processes have been widely used for disinfection, removal of residual organic material, and for the removal of emerging contaminants from drinking water and wastewater. Yet, the application of these technologies to sludge treatment processes has not gained enough attention, mostly, considering the complexity of the sludge matrix. In this research, ozone and UV/H₂O₂ treatment were applied for the removal of emerging contaminants from a digestate supernatant. The removal of the following compounds was assessed:(i) salicylic acid (SA) (a surrogate of non-steroidal anti-inflammatory drugs (NSAIDs)), and (ii) sulfamethoxazole (SMX), sulfamethazine (SMN), and tetracycline (TCN) (the most frequent human and animal antibiotics). The ozone treatment was carried out in a plexiglass bubble column reactor with a capacity of 2.7 L; the system was equipped with a stirrer and a gas diffuser. The UV and UV/H₂O₂ treatments were done using a LED set-up (PearlLab beam device) dosing H₂O₂. In the ozone treatment evaluations, 95 % of the three antibiotics were removed during the first 20 min of exposure time, while an SA removal of 91 % occurred after 8 hours of exposure time. In the UV treatment evaluations, when adding the optimum dose of hydrogen peroxide (H₂O₂:COD molar ratio of 0.634), 36% of SA, 82% of TCN, and more than 90 % of both SMX and SMN were removed after 8 hours of exposure time. This study concluded that O₃ was more effective than UV/H₂O₂ in removing emerging contaminants from the digestate supernatant.

Keywords : digestate sludge, emerging contaminants, ozone, UV-AOP

Conference Title : ICAOPWT 2022 : International Conference on Advanced Oxidation Processes for Wastewater Treatment

Conference Location : Helsinki, Finland

Conference Dates : July 19-20, 2022