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Partial Oxidation of Micropollutants by Vacuum-UV-Radiation-Reactor Development and Testing
Abstract

The accumulation of organic micropollutants in the world's aquatic systems has alerted the wastewater treatment community to the likelihood of future treatment regulations. Acute and chronic toxicity raise concerns for ecosystems as well as human and animal life. Insufficient removal in traditional wastewater treatment processes has advanced research into tertiary treatment options such as Advanced Oxidation Processes (AOPs). V-UV is a promising AOP treatment option that successfully creates highly oxidizing hydroxyl radicals without the need for an added chemical oxidant. As part of a project at the University of Stuttgart to eliminate organic micropollutants in wastewater effluent, a V-UV reactor has been tested to partially degrade these substances. A second treatment step will include a submerged attach growth bioreactor to further degrade the more bioavailable stream from the V-UV oxidation phase. A planned pilot plant scale facility will be comprised of the combined oxidative-biological process that is optimized through laboratory scale experiments. These experiments for the V-UV phase focused on design variables such as water flow rate, temperature, and turbulence in order to improve the design of the future pilot plant facility. This thesis details the laboratory scale tests of the V-UV reactor to test its efficacy to eliminate organic micropollutants and found that the experimental results and the estimated energy demand gives the V-UV a discernible advantage over the low pressure and medium pressure UV free surface reactors tested previously as part of this project.