Removal of Two Pharmaceuticals, 5-Fluorouracil and Trimethoprim from Aqueous Media with UV, UV/VUV and VUV Photolysis

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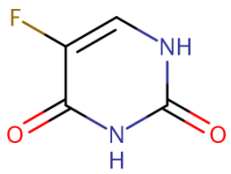
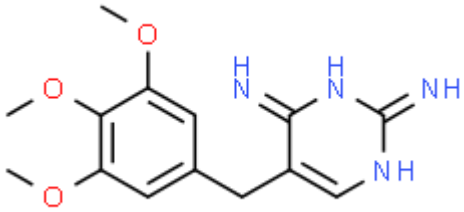
In recent years, drug residues have been detected in an increasing number of living waters around the world, which is partly the result of excessive drug use and inadequate water treatment. Conventional water treatment methods are not always able to completely remove biologically active organic contaminants (e.g. pharmaceuticals) in low concentrations. Unfortunately, biologically treated municipal wastewater, discharged by urban wastewater treatment plants, also contributes to the release of these organic micro-pollutants into the environment, so it is highly important to investigate and develop additional water treatment processes to increase the efficacy of conventional water treatment methods.



5-Fluorouracil



Trimethoprin

In this study, disposal options with advanced oxidation processes (AOPs) were investigated of two drugs that pose a serious environmental risk. One of those is the 5-fluorouracil (5-FU), which is one of the most commonly used chemotherapeutic agents, used to treat colon and breast cancer. Another is trimethoprim (TRIM) a broad-spectrum antibiotic, widely used in combination with sulfonamides.

This study aims to investigate the high energy resources based AOPS, namely UV (254 nm), UV/VUV (254/185 nm), and VUV (172 nm), on the transformation and mineralization of these drugs. For the investigations two types of low-pressure mercury vapor lamps and a Xe-excimer lamp were used. The flux of 254 nm photons was determined via Fe-oxalate based, while the flux of 185 and 172 photons was determined via methanol based chemical actinometry. Comparison of the methods was based on the transformation and mineralization rates, quantum efficiency and energy requirement. The formation of intermediates was compared and reaction mechanisms were suggested.

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