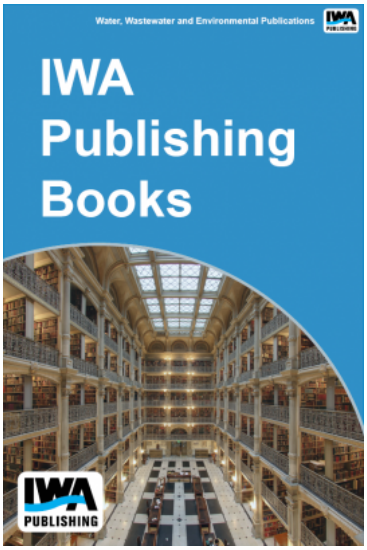
Enhancing Biodegradability of Refractory Aromatics in Wastewater



Chlorinated aromatics, nitroaromatics, and azoaromatics are widely used in industry. As a result, these compounds are commonly present in industrial wastewater. Aerobic biological treatment processes are often inefficient for wastewaters containing these organic pollutants because most of these aromatic compounds are resistant to aerobic degradation. The goal of this research is to investigate the feasibility of elemental iron to pretreat wastewater through reduction of the azo and nitro functions, thus making these compounds more biodegradable prior to entering biological treatment processes, such as activated sludge.

The experimental approach involved a series of batch reduction experiments to test the treatability, via chemical reduction, of a suite of compounds (nitrobenzene, 2,4-dinitrotoluene, orange G, orange II, orange IV, orange I, 1,2,4-trichlorobenzene, and pentachlorophenol) as well as the effects that various synthetic wastewater components would have on reduction rates. Once reduction products were identified in the batch reduction experiments, they were tested for their aerobic biodegradability through batch biodegradation and respirometric studies. A set of column experiments to examine iron life span were the final precursor to design and operation of a bench-scale integrated iron column-activated sludge treatment system for azo dyes.

Results from batch reduction experiments indicate that azo dyes and nitroaromatics are rapidly transformed to their reduced counterparts. In all cases, the pretreatment of recalcitrant compounds via reduction with elemental iron enhanced their aerobic biodegradability.

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