

Herbicide Chlorsulfuron Degradation in Water Solution by Electrochemical Method
(電気化学法による水溶液中の除草剤クロルスルフロンの分解)

Increased concerns about the herbicides in water have arisen because of the danger they pose to aquatic life and to any kind of life in contact with the polluted water. These compounds are recalcitrant (nonbiodegradable) and can persist for long periods of time. Chlorsulfuron (ChS) is a kind of sulfonylurea herbicide for the selective pre- and post-emergence control of broad-leaved and grass weeds in cereal crops. However, its high phytotoxicity and relatively high solubility make it to be potential contaminant in water bodies.

Electrochemistry is a promising method for water and wastewater treatment and has received considerable attention recently. Nowadays, RuO₂-based type dimensionally stable anode (DSA) has been proved to maintain good catalytic activity and dimensional stability for oxygen evolution reaction (OER), and exhibited excellent performance for degradation of organic compounds. The major objective of this study is to evaluate the performance of electrochemical degradation of ChS herbicide using DSA.

In this study, Ti/RuO₂-Pt and Ti/Pt anode were examined for the performance during the electrochemical degradation of ChS. In order to investigate the ChS degradation efficiency and related reaction mechanisms, current density, initial Chlorsulfuron concentration, initial solution pH, NaCl dosage, free radicals level and oxidizing substance were measured, and the role of hypochlorous acid formed during electrolysis was also analyzed.

It was found that the ChS removal rate increased with increasing current density. For the Ti/RuO₂-Pt anode, the optimum condition was reached under pH of 11, while for the Ti/Pt anode, the optimum condition was reached under pH of 3. In the presence of NaCl, the degradation efficiency was greatly increased for both of Ti/RuO₂-Pt and Ti/Pt anode. HOCl quickly formed during electrolysis would likely play an important role in the electrochemical degradation of ChS in the presence of NaCl.