



Degradation of Orange II by electrochemical activation of persulfate: performance and mechanism

Shumin Zhu^a, Shiqing Zhou^b, Yanghai Yu^b, Naiyun Gao^a, Bingzhi Dong^{a,*}

^aState Key Laboratory of Pollution Control and Resource Reuse, College of Environmental Science and Engineering, Tongji University, Shanghai 200092, China, Tel. +86 21 65982691; email: dbzwater@163.com (B. Dong)

^bDepartment of Water Engineering and Science, College of Civil Engineering, Hunan University, Changsha, Hunan 410082, China

Received 11 December 2016; Accepted 26 August 2017

ABSTRACT

In this study, the degradation of Acid Orange II (AO II) by electrochemical activation of persulfate was systematically investigated. Iron electrode as the source of Fe²⁺ was verified to be the efficient activator for persulfate to produce sulfate radicals, which exhibited promising ability to degrade AO II than persulfate and electrocoagulation process. Compared with the addition of Fe²⁺ directly, the removal rates of AO II in the EC/PS system were almost twice of those in the Fe²⁺/PS system at all the applied currents. The application of radical scavenger confirmed that both SO₄^{-•} and OH[•] existed in the EC/PS system and SO₄^{-•} is the predominant radical species for AO II degradation. Furthermore, increasing the applied current, persulfate concentration and reaction temperature improved the removal of AO II. The comparison of UV–visible spectrum demonstrated that the azo double bond in the AO II structure was destroyed efficiently and under current control in the EC/PS system. Finally, the degradation pathway was proposed in this study based on the results of gas chromatography–mass spectrometry (GC–MS).

Keywords: Electrochemical activation; Sulfate radical; Acid Orange II; Ferrous ions

* Corresponding author.