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Zhengyu Dong, Qian Zhang, Bor-Yann Chen, Junming Hong

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Oxidation of Bisphenol A by persulfate via $\text{Fe}_3\text{O}_4\text{-}\alpha\text{-MnO}_2$ nanoflower-like catalyst: Mechanism and efficiency

Zhengyu Dong^{1,2}, Qian Zhang^{1,2}, Bor-Yann Chen³, Junming Hong^{1,2*}

(1. Department of Environmental Science and Engineering, Huaqiao University,

Xiamen 361021, China ;

2. Fujian Provincial Research Center of Industrial Wastewater Biochemical Treatment

(Huaqiao University), Xiamen 361021, China;

3. Department of Chemical and Materials Engineering, National I-Lan University, I-

Lan 26047, Taiwan)

Abstract

A novel and high-efficiency $\text{Fe}_3\text{O}_4\text{-}\alpha\text{-MnO}_2$ nanoflower-like catalyst was synthesized using a two-step hydrothermal method. The catalyst was used to activate persulfate (PS) to degrade bisphenol A (BPA) in aqueous phase. The mechanism of the $\text{Fe}_3\text{O}_4\text{-}\alpha\text{-MnO}_2$ /PS system was investigated. X-ray photoelectron spectra and cyclic voltammograms showed that the mixed valence of $\text{Fe}_3\text{O}_4\text{-}\alpha\text{-MnO}_2$ was favorable to electron transfer between Fe and Mn elements. Apparently, this process promoted the circulation of $\text{Fe}^{2+}/\text{Fe}^{3+}$ and $\text{Mn}^{3+}/\text{Mn}^{4+}$, increasing the effectiveness of the catalyst to activate the PS. In addition, with ATR-FTIR analysis, the influence of phosphate confirmed the presence of $-\text{OH}$ groups on the $\text{Fe}_3\text{O}_4\text{-}\alpha\text{-MnO}_2$ surface. Thus, these groups played crucial roles in the PS activation. Sulfate radicals were reacting species of great importance in BPA degradation. The degradation intermediates were also detected via GC-MS analysis, and the possible BPA degradation pathway was proposed.

Keywords: BPA degradation; $\text{Fe}_3\text{O}_4\text{-}\alpha\text{-MnO}_2$; hydroxyl groups; synergistic effect

*Corresponding author. Department of Environmental Science and Engineering, Huaqiao University, Fax: +86-5926162300; (E-mail): jmhong@hqu.edu.cn.

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