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Oxidation of Bisphenol A by persulfate via Fe_3O_4-α-MnO_2 nanoflower-like catalyst: Mechanism and efficiency

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Abstract

A novel and high-efficiency Fe_3O_4-α-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 Fe_3O_4-α-MnO_2/PS system was investigated. X-ray photoelectron spectra and cyclic voltammograms showed that the mixed valence of Fe_3O_4-α-MnO_2 was favorable to electron transfer between Fe and Mn elements. Apparently, this process promoted the circulation of Fe^{2+}/Fe^{3+} and Mn^{3+}/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 –OH groups on the Fe_3O_4-α-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; Fe_3O_4-α-MnO_2; hydroxyl groups; synergistic effect

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