

The decolorization and mineralization of Acid Orange 6 Azo Dye in aqueous solution by Advanced Oxidation Processes: A Comparative Study

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摘要.

Abstract

The comparison of different advanced oxidation processes (AOPs), i.e. ultraviolet (UV)/TiO₂, O₃, O₃/UV, O₃/UV/TiO₂, Fenton and electrocoagulation (EC), is of interest to determine the best removal performance for the destruction of the target compound in an Acid Orange 6 (AO6) solution, exploring the most efficient experimental conditions as well; on the other hand, the results may provide baseline information of the combination of different AOPs in treating industrial wastewater. The following conclusions can be drawn: (1) in the effects of individual and combined ozonation and photocatalytic UV irradiation, both O₃/UV and O₃/UV/TiO₂ processes exhibit remarkable TOC removal capability that can achieve a 65% removal efficiency at pH 7 and O₃ dose = 45 mg/L; (2) the optimum pH and ratio of [H₂O₂]/[Fe²⁺] found for the Fenton process, are pH 4 and [H₂O₂]/[Fe²⁺] = 6.58. The optimum [H₂O₂] and [Fe²⁺] under the same HF value are 58.82 and 8.93 mM, respectively; (3) the optimum applied voltage found in the EC experiment is 80 V, and the initial pH will affect the AO6 and TOC removal rates in that acidic conditions may be favorable for a higher removal rate; (4) the AO6 decolorization rate ranking was obtained in the order of O₃ < O₃/UV = O₃/UV/TiO₂ < EC < Fenton; (5) the ranking of TOC removal efficiency of selected AOPs was in the order of O₃ = Fenton < EC < O₃/UV < O₃/UV/TiO₂ for 30 min of reaction time.