Pretreatment of petroleum refinery wastewater by microwave-enhanced Fe⁰/GAC micro-electrolysis

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ABSTRACT

The pretreatment of petroleum refinery wastewater (PRW) was experimentally investigated using the Fe⁰/granular activated carbon (GAC) micro-electrolysis system in the absence or presence of microwave. Effects of reaction time, pH value, Fe⁰ and GAC dosage, Fe⁰/GAC volumetric ratio, and microwave power on the treatment efficiency of wastewater were studied. A significant synergetic effect was observed between microwave irradiation and Fe⁰/GAC. The optimum conditions were determined to be: microwave power 500 W, reaction time 15 min, iron filings dosage 30 g/L, GAC dosage 5.75 g/L, and initial pH 3. Under the optimum conditions, chemical oxygen demand (COD) removal efficiencies were 38.3 and 62.2% in the absence and presence of microwave irradiation, respectively. The biodegradability of the wastewater was greatly improved by the microwave enhanced micro-electrolysis treatment. The results of the present study demonstrated that the pretreatment process was favorable for the subsequent biological process.

Keywords: Internal micro-electrolysis; Microwave; Biodegradability; Pretreatment