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Treatment of Nitrobenzene Wastewater via Ultrasonic Enhanced Iron-carbon Micro-electrolysis with Response Surface Methodology

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Abstract: Aiming at whether there are interaction problem among various operating factors in the degradation of wastewater with nitrobenzene (NB) via an ultrasonic enhanced iron-carbon micro-electrolysis method, the process conditions were optimized by response surface methodology (RSM). In experiments, selecting 29 representative groups as the test points, taking ultrasonic (US) power, zero valent iron (Fe^0) dosage, activated carbon (GAC) dosage, initial pH value of wastewater as main factors, removal efficiency of NB as response value, the response surface experiments of four factors and three levels were designed and the optimum process conditions were obtained. The results show that there is a significant interaction between Fe^0 dosage and initial pH value, and initial pH value and ultrasonic power and predicted value of the removal efficiency of NB is 98.50% when the Fe^0 dosage is 20.7 g·L^{-1}, the GAC dosage is 13.19 g·L^{-1}, the initial pH value is 2.08, the ultrasonic power is 175.96 W. A difference of 1.23%(<2%) is observed with the measured value. Therefore, the obtained secondary mathematical model for the degradation of NB via ultrasonic enhanced iron-carbon micro-electrolysis has a good reliability for the optimization of process conditions and the prediction of removal efficiency of NB.

Key words: ultrasonic; iron-carbon microelectrolysis; nitrobenzene; wastewater; response surface methodology
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