

234e Oxidation of Reactive Blue 19 Dye Wastewater in a Porous Electrode Ozone Generator and Reactor

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Textile dye wastewaters are of environmental concern due to their poor biodegradability for removal by biological treatment. The use of ozone for the degradation of textile industry wastewater has been widely studied and cited in literature. Preozonation has been found to be effective in decolorizing and enhancing biodegradability of such wastewater and reducing the pollution load. However, the cost of ozonation is high due to poor gas-liquid mass transfer, and self-decomposition reactions. Ozonation efficiency can be increased by generating the ozone in situ, and reacting it immediately with the contaminants in the wastewater. Enhancing the mass transfer and reaction efficiencies will tend to reduce overall cost of ozonation substantially. In this paper, a novel porous electrode system is developed for the generation and reaction of ozone with contaminants in aqueous phase. The in situ ozone generator design is based on a novel type of corona discharge tube construction, wherein the discharge gap is kept juxtaposed to the tubular pathway through which the treatment fluid is passed. Ozone is generated around the periphery of the porous electrode tube, and diffuses immediately into the contaminated fluid flowing inside the tube. The inner porous ceramic tube is grounded while the outer glass electrode is positively charged for corona discharge.

Comparative experimental studies on mass transfer and dye oxidation rates in the in situ porous electrode system and the conventional complete mixed reactor system have been conducted. These studies indicate that ozone mass transfer rate is enhanced by an order of magnitude in the in situ system compared to the conventional ozonator. Oxidation rate of the anthraquinone dye is affected by pH, ozone concentration, feed gas flow rate, and initial dye concentration. These data and the effects of these variables on COD of the dye wastewater will be presented.