Evaluation of decolorization, mineralization, and toxicity reduction of an azo dye C.I. Reactive Black 5 in a countercurrent bubble column by ozone

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摘要.

Abstract

A countercurrent and continuous-flow design bubble column reactor (BCR) was used to investigate variations in traditional parameters of water-containing Reactive Black 5 (RB5) under different gas/liquid flow rates. RB5 is a long-chain diazo dye with a high molecular weight that is widely applied in industry. The results revealed that the variations were functions of the flow rates of the liquid and/or gas and of operation column height. Pseudo-first-order or global-second-order reaction types were used to describe the variations, and the monitored parameters i.e., total organic carbon (TOC), sulfate, and nitrate. Not only did flow patterns affect the RB5 removal and the mineralization of derivatives, but column height might also have had an influence on ozone consumption. It was observed that the extent of decolorization and mineralization decreased as the sampling port height increased, indicating that the column height may reflect the retention time of ozone gas and the contacting time between ozone and RB5 in the BCR system. Biodegradability was enhanced by ozone treatment, although the effect was not proportional to the amount of ozone consumption. An experimental regression model was proposed to predict the variations in color\di/color0, TOC\di/TOC0, and sulfate yield (YSO\(2-/4) throughout this investigation