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MINERALIZATION OF SALICYLIC ACID IN WATER BY CATALYTIC OZONATION

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Abstract

The influence of key process parameters of homogenous catalytic ozonation using ferrous or manganese catalysts on the mineralization rate of salicylic acid (SA), model pharmaceutical pollutant, in water was investigated. In order to assess the combined influence and interactions of studied process parameters as well, the empirical/statistical approach applying Box-Behnken experimental design (BBD) combined with response surface methodology (RSM) was applied. Three numerical and one categorical variables representing the key process parameters (initial pH, concentration of ozone, concentration and type of catalyst) were included in applied BBD. RSM models predicting the mineralization rate of SA in dependence on studied process parameters were developed, while their significance and accuracy were evaluated on the basis of analysis of variance (ANOVA) and obtained statistical parameters (R^2, F, p). The developed models are characterized as highly accurate and predictive for the studied system behavior. Evaluation of the influence of all four process parameters showed that mineralization rate of SA strongly depends on the initial pH, ozone concentration and combined interactions between the initial pH and type of catalyst. When two processes, O_3/Fe^{2+} and O_3/Mn^{2+}, were observed separately, significant differences between them were determined, particularly related with complexing chemistry of applied catalysts within the investigated pH range.

Key words: catalytic ozonation, design of experiments, process parameters, salicylic acid, wastewater

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