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Catalyst reutilization in phenol homogeneous cupro-Fenton oxidation

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Abstract:

The catalytic wet peroxide oxidation of phenol (1g/L) was performed in a laboratory batch reactor using the cupro-Fenton homogeneous reaction. At 70°C and using 200 mg/L of Cu (II) complete phenol removal, high TOC reduction (ca. 85%) and efficient use of hydrogen peroxide were achieved. A lumped kinetic model that accounts for organics mineralization and peroxide consumption was developed to predict reactants and Total Organic Carbon profiles. After the reaction step, Cu(II) was recovered by precipitation with NaOH; Cu(II) concentration in the discharged liquid was always less than the 1 mg/L. The sludge was reused in subsequent reaction steps with minor fluctuations in the catalytic activity. The combination of the cupro-Fenton reaction with an alkaline precipitation procedure allows lower operational costs and helps to reduce the toxicity of the treated wastewater.

Keywords: Phenol mineralization; homogeneous cupro-fenton; sludge reutilization.

1. Introduction

Effluents containing phenolic compounds can be effectively treated by the Fenton process. This method consists in the reaction of Fe(II) species with H₂O₂ under acidic conditions to generate highly oxidizing hydroxyl radicals (HO[•]) [1]. Although this process presents several advantages over other oxidation techniques [2, 3], one

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