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ADVANCES IN CLEANER PRODUCTION

“CLEANER PRODUCTION INITIATIVES AND CHALLENGES FOR A SUSTAINABLE WORLD”

Mechanistic Study of the Fenton and Cupro-Fenton Reactions by Voltammetric Analysis *in situ*

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Abstract

Although Fe(II) exhibits a high initial rate of degradation, the degradation is not complete due to the formation of compounds refractory to the hydroxyl radical. In the presence of Cu(II), the degradation is slower, but results in a greater reduction of TOC at the end of the reaction ($t = 120\text{min}$). The addition of Cu(II) ions classical Fenton reaction (Fe(II) plus H_2O_2 at pH 3) is found to accelerate the degradation of organic compounds. This synergic effect causes an approximately 15% additional reduction of the TOC. Voltammetric studies confirm the catalytic role of catechol in the presence of Fe(III)/Fe(II) and Cu(II)/Cu(I). Addition of aliphatic acids to the reaction medium, did not interfere with the cupro-Fenton reaction, but had an inhibitory effect on the classical Fenton reaction, consistent with the following order of interaction with the ion Fe(III): Oxalic Acid (OA) \gg Formic Acid (FA) \sim Acetic acid (AA).

Keywords: Phenol, ions Copper and Fenton reaction.

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