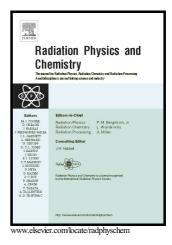
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ACCEPTED MANUSCRIPT

Use of bovine catalase and manganese dioxide for elimination of hydrogen peroxide from partly oxidized aqueous solutions of aromatic molecules – unexpected complications

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Abstract

Being a toxic substance, hydrogen peroxide (H_2O_2) formed during application of advanced oxidation processes disturbs the biological assessment of the treated solutions. Therefore, its removal is necessary when the concentration exceeds the critical level relevant to the biological tests. In this study, H_2O_2 removal was tested using catalase enzyme or MnO_2 as catalysts and the concentration changes were measured by the Cu(II)/phenanthroline method. MnO_2 and Cu(II) ions were found to react not only with H_2O_2 but also with the partly oxidized intermediates formed in the hydroxyl radical induced degradation of aromatic antibiotic and pesticide compounds. Catalase proved to be a milder oxidant, it did not show significant effects on the composition of organic molecules. The Cu(II)/phenanthroline method gives the correct H_2O_2 concentration only in the absence of easily oxidizable compounds, e.g. certain phenol type molecules.

1. Introduction

In Advanced Oxidation Processes (AOP) used for elimination of toxic organic substances from water/wastewater, the oxidation of contaminants is usually induced by hydroxyl radical ('OH) reactions. During these reactions in aerated solutions hydrogen peroxide (H₂O₂) always forms in relatively high concentrations, e.g. in the reaction sequence: organic radical + O₂ \rightarrow peroxy radical \rightarrow O₂[•]/HO₂[•] elimination (von Sonntag, 2006). The termination reaction of the O₂[•]/HO₂[•] pair gives H₂O₂. When high energy ionizing radiation is used for water treatment Download English Version:

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