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Methods for the Detection of Residual Concentrations of Hydrogen Peroxide in Advanced Oxidation Processes

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Objectives

The purpose of this project was to develop a laboratory method for reliable quantification of hydrogen peroxide in 0.5 – 5 mg/L concentration range that is effective in a natural water matrix as well as in the presence of combined chlorine (chloramine).

Highlights

This project found identified thirteen different published methods for hydrogen peroxide detection. These included titration, spectrophotometry, fluorescence and chemiluminescence. It was determined that the method should be relatively simple. For this reason a two spectrophotometric method were tested:

- Copper/DMP
- Titanium oxalate

It was found that the H_2O_2-absorbance correlation for the copper/DMP method was greater than the titanium oxalate method, indicating that the copper/DMP method is inherently more sensitive to the presence of peroxide than the titanium oxalate method. But the copper/DMP method was found to be sensitive to the presence of chloramine and/or organic matter in water, while the titanium oxalate method was not.

Results/Findings

The titanium oxalate method is an effective detection method for hydrogen peroxide. The basis of the method is the formation of a titanium(IV) – peroxide complex in the presence of sulfuric acid. Potassium titanium oxalate ($K_2TiO(C_2O_4)_2 \cdot H_2O$), a commercially available titanium(IV) salt, is used as the source of titanium(IV). The titanium(IV) – peroxide complex is yellowish orange in color and its concentration can be quantified by spectrophotometric analysis with a maximum response at 390 nm. This method was found to have a method detection level (MDL) of 0.05 mg/L, with a precision of 5% and bias of -2% when detecting peroxide in the milligram per liter range in reuse water.