CHAPTER 5

CONCLUSIONS

This research investigated the effects of Fenton's reagent on the increase of AOC concentration and identified optimal conditions for maximizing AOC_{P17}, AOC_{NOX}, and AOC_{total} production. Three different doses of H_2O_2 (H_2O_2:DOC of 0.5:1, 2:1, and 10:1) and Fe^{2+} (Fe^{2+}:H_2O_2 of 0.05:1, 0.1:1, and 0.5:1) and three pH (2, 3, and 4) were studied. Surface water and 2,4-DCP synthetic solution were the two types of water samples used in the experiment.

In both types of water samples, increasing H_2O_2 dose resulted in the enhancement of AOC production. Between the two types of water samples, the AOC enhancements were not significantly different at the two low H_2O_2 doses. At the highest dose, the enhancement in synthetic water samples was more than that in surface water samples. For both types of water samples, the two high H_2O_2 concentrations provided more AOC_{P17} production than AOC_{NOX} production whereas the lowest dose resulted in more AOC_{NOX} production than AOC_{P17} production.

Initial pH was another factor that influenced AOC production. In both types of water samples, the optimal pH was 3 whereas pH 2 offered the least AOC enhancement. Increasing Fe^{2+} concentration did not enhance AOC production for both types of water samples; instead, it accelerated the rate of production. At the highest Fe^{2+} dose, AOC was instantaneously and mostly produced in the first minute of reaction. For lower doses, AOC production proceeded slower.

The 10-minute reaction time is a minimum time requirement to ensure a maximum or near maximum AOC enhancement for both types of water samples. More than 85% of AOC production was completed within this duration. The rate of AOC production for both types of water samples was more agreeable with the first order kinetic than the second order kinetic. The correlation between kinetic constant (k) and the three tested variables could not be established due to the inadequate data in the first minute reaction time that resulted in unreliably low k values.

The best conditions for AOC_{total} and AOC_{P17} productions in surface water samples were at the H_2O_2 dose of 10:1, Fe^{2+} dose of 0.05:1, and pH 3. For synthetic water samples, the optimal conditions for AOC_{total} and AOC_{P17} were observed at the H_2O_2 dose of 10:1, Fe^{2+} dose of 0.5:1, and pH 3. For AOC_{NOX}, the highest production was found at the H_2O_2 dose of 10:1, Fe^{2+} dose of 0.1:1, and pH 3 in both types of water samples.

It is evident that Fenton's reagent can enhance AOC production in water. Through its use, NBOM is changed to BOM and some portions of which are completely oxidized to CO_2. To maximize Fenton's efficiency for increasing AOC, H_2O_2 dose is the most critical parameter whereas pH is the second most important factor.