

CHAPTER 5



CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

- The oxidation reaction of formaldehyde and methanol show as a three-stage reaction. The oxidation rate was very fast at the first 5 min then gradually slowed down, and they were slower after 20 min
- Photo-Fenton process could significantly increase the efficiency of formaldehyde and methanol oxidation in aqueous solution when compared with that of UV/H₂O₂ process.
- The effect of initial pH on formaldehyde and methanol was not obvious. However, initial pH 2.6 provided the highest efficiency for formaldehyde oxidation.
- It is evident that the initial rate of formaldehyde and methanol increased with increasing H₂O₂ concentration. Moreover, increasing the concentration of hydrogen peroxide did not inhibit the oxidation of formaldehyde and methanol.
- The removal efficiency of formaldehyde and methanol increase with increasing Fe²⁺ concentration. However, at concentration of Fe²⁺ more than 6.67x10⁻² M, 8.33x10⁻² M, the removal efficiency of formaldehyde and methanol were almost the same as 6.67x10⁻² M of Fe²⁺.
- The removal efficiency of formaldehyde decreased with increasing methanol concentration. Due to the presence of high concentration of methanol; 0.333 M and 0.667 M, the oxidation reaction of formaldehyde was stopped after 20 min.
- Initial pH played an obvious effect in the beginning stage of the oxidation reaction in the Fenton process. However, after 80 min the removal ratios of formaldehyde and methanol at different pH values were almost the same.

- UV light has the highest promotion efficiency at the concentration of Fe^{2+} of 2.27×10^{-2} M, at higher concentration, 6.67×10^{-2} M, the efficiencies of Fenton and photo-Fenton for treating formaldehyde and methanol were almost the same.
- Fenton and photo-Fenton processes, but not UV/ H_2O_2 process, can completely mineralized formaldehyde (containing methanol).
- In UV/ H_2O_2 process, even CH_2O was almost degraded at the end of 240 min; this process can not remove the toxicity of formaldehyde (containing methanol). While in Fenton and photo-Fenton processes, all the toxicity of formaldehyde (containing methanol) can be removed.

5.2 Recommendations

- The oxidation intermediate of formaldehyde and methanol treated by Fenton and photo-Fenton processes should be identified.
- Higher UV lamp power should be applied for formaldehyde and methanol oxidation by photo-Fenton process.
- The conditions obtained from this study should be applied for a real waste containing formaldehyde and methanol.
- The competition between formaldehyde and methanol should be further studied.