CHAPTER V

CONCLUSIONS AND SUGGESTIONS FOR FUTURE WORKS

5.1 Conclusions

The Design-Expert Software was proven to yield the statistically reliable result for *o*-toluidine and COD removals by electro-Fenton process. pH, H_2O_2 and Fe^{2+} were significant factors for *o*-toluidine oxidation under the studied condition whereas current density had insignificant effect so the current was kept constant at 1 A through out the study. Under the optimum parameters obtained from the program of pH 2 and Fenton reagent doses of 1 mM and 4.85 mM for Fe^{2+} and H_2O_2, respectively.1 mM of *o*-toluidine could be completely removed in 90 minutes and 50% of COD was reduced in 2 hours. For photoelectro-Fenton processed, OT was removed faster and could be completely removed in at 60 minutes. In contrast, only 90% of OT was removed when treated by conventional Fenton process at the end of treatment time of 2 hours.

From the kinetic information, the oxidation of OT was a two-stage reaction which the initial stage was under influence of Fe^{2+}/H_2O_2 reaction and second stage involves Fe^{3+}/H_2O_2 reaction. The initial stage could be explained by pseudo-zero order reaction while second stage could be explained by pseudo-first order kinetic rate law. The initial rate reaction by several Fenton processes were determined with 0.369, 0.384 and 0.389 M min^{-1} and the first-order kinetic rate constant were 0.0124, 0.0356 and 0.0572 min^{-1} for Fenton, electro-Fenton and photoelectro-Fenton processes, respectively. For the biodegradation efficiency, BOD_5/COD ratio representing the index for OT detoxification increased as the reaction proceeded. The BOD_5/COD ratio increased from 0.125 by conventional Fenton process to 0.289 by electro-Fenton process and increased further with photoelectro-Fenton process to 0.357 in 60 minutes. The intermediates from OT oxidation with ·OH were maleic and oxalic acids. Both electric current and UV-light application could significantly enhance the treatment performance over the conventional Fenton process.

5.2. Suggestions for future work

1. Range of studied parameters should be expand in order provide a more precise prediction from the software.
2. Real wastewater should be applied to study the effect of other components other parameters in real wastewater on the degradation behavior.
3. Other light wavelength such as visible light should be applied to examine the degradation efficiency.