CHAPTER V

CONCLUSIONS

5.1 Conclusions

The removal of *o*-toluidine had been investigated by applying Fenton with fluidized-bed reactor. The following conclusions can be drawn from this study. The process was found to be the efficient method to remove that compound from the solution. Statistical experimental design was proved to be the accurate tool for determining the optimum condition with minimal experiments. The conclusions drawn from the results of this study were as follows:

- The two-level-factorial and Box-Behnken designs have been proven to be the accurate tool for the determination of key factors and optimum conditions with minimal experimental requirement.
- Under the studied conditions, Fe^{2+}, H_2O_2, and pH were found to be significant to o-toluidine removal whereas the amount of carrier was not a key factor.
- Fe^{2+} and H_2O_2 showed the positive effect on *o*-toluidine degradation. While initial *o*-toluidine concentration showed the negative effect on *o*-toluidine degradation.
- Optimal pH, Fe^{2+} and H_2O_2 for the removal of 1 mM of *o*-toluidine using 100 g of SiO_2 were 3, 1 mM and 17 mM, respectively, which could predictably provide the removal efficiencies of 90.2 and 41.4 % for *o*-toluidine and COD, respectively.
- The oxidation of *o*-toluidine was found to be a two-stage reaction. The first stage was under the influence of Fe^{2+}/H_2O_2 reaction whereas the second stage was controlled by Fe^{3+}/H_2O_2 reaction. Within the studied ranges of 0.1 to 2 mM Fe^{2+}, 1 to 34 mM H_2O_2, 1 mM *o*-toluidine, 100 g SiO_2 and pH 3, the rate law for the second stage reaction can be expressed by the following reaction:

$$d[\text{o-toluidine}]/dt = -2.14\times10^{5}[Fe^{2+}]^{1.77}[H_2O_2]^{0.79}[OT]$$

- For managerial purpose, the kinetic findings from this study can be used to design the reactor for treating wastewater contaminated with *o*-toluidine.

5.2 Suggestion for Further Studies

- Determine for the intermediates produced during the oxidation of *o*-toluidine by hydroxyl radicals.
- Using different type of carrier rather than SiO_2 to compare the removal efficiency of organic pollutant and iron.
- Investigate the behavior of fluidized-bed Fenton process under the continuous operation.