CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

In the photocatalytic reduction of chromium (VI) using Rotating Disc Photocatalytic Reactor (RDPR), the efficiency of Chromium (VI) removal was strongly influenced by the operation of the reactor. The initial pH of wastewater, the wastewater flow rate(Q_w), the rotation speed of disc plate (V_r), the active surface area of catalyst and the initial concentration of wastewater were the major parameters controlling the efficiency of chromium (VI) removal. The photocatalytic reactivity of the capable operating parameters was also studied.

The results of photocatalytic reduction of chromium (VI) using Rotating Disc Photocatalytic Reactor can be summarized below:

5.1.1 The initial pH of wastewater was strongly affected to Chromium (VI) removal. At the basic pH (pH 11), the photoreduction could not occur and at natural pH (pH 7), the photocatalysis reaction can be occurred but the reaction rate is relatively low. The optimum initial pH of wastewater was found at pH 3.

5.1.2 The wastewater flow rate (Q_w), which was an important parameter in the operating of continuous mode reactor, had an effect on the treating cycle of wastewater which was direct proportion to the efficiency of chromium (VI) removal. The reaction rate of Chromium (VI) removal increased when increasing the flow rate of wastewater. The highest reaction rate occurs at 90 ml/s.

5.1.3 The rotation speed of disc plate (V_r) played an important role on the operation of RDPR. A rotation speed disc was the function of reaction rate. The increasing of kinetic coefficient constant (k) was occurred when increasing of rotation speed cause of the increasing rotating cycle in experimental time. From this research, the maximum rotation speed of disc plate was 200 rpm and it provided highest kinetic coefficient rate 0.2489 mg/l.min.

5.1.4 TiO_2 coating surface area was directly affected to the efficiency of chromium (VI) removal. Owing to the photocatalysis reaction was related to amount of catalyst in the system, 0.2924 m^2 of TiO_2 coating surface area which contain 661 mg of TiO_2 was the maximum value using in this work. It provided the highest reaction rate 0.1308 mg/l.min.

5.1.5 In varying of initial concentration of chromium (VI), kinetic consideration of the chromium (VI) removal was represented in zero order pattern with the capacity of this reactor less than and equal to 150 ppm. The chromium (VI) removal was representing in pseudo-first order pattern when initial concentration higher than 150 ppm.

5.1.6 For the pseudo-first order pattern, the Langmuir Hinshewood rate was determined the relationship between the initial degradation rate and the initial concentration of chromium (VI). The reduction rate constant of chromium (VI), k in the range of initial concentration 150 to 500 ppm can determined 0.3592 mg/l.min and the adsorption equilibrium constant, $K_{Cr\,(VI)}$ was 0.0482 l/mg.

5.2 Recommendations

In application of Rotating Disc Photocatalytic Reactor (RDPR) in the real situations, the scale up of the reactor should be carefully designed in order to produce the reactor that is suitable for industrial process. The recommendations for further research are shown as follows:

1. Investigation on the effect of other parameters which affecting the reactor operation such as the turbidity and the temperature of real wastewater.

2. The photacatalytic removal of other pollutants, organics and organic species, should be investigated as they also presented in real wastewater.

3. In application of RDPR for photocatalysis process in the real situations which have various chromium (VI) concentrations containing, the reaction rate constants obtained from this research is beneficial for forecast of removal behavior.

4. The reuse of the TiO_2 rotating discs plate is the interesting point which should be specifically to study.