CHAPTER V
CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

In this research, the synthesized mesoporous-assembled TiO_2 nanoparticle photocatalyst was synthesized by a sol-gel process with the aid of a structure-directing surfactant and used to investigate the photocatalytic degradation of the mixture of two azo dyes: Acid Yellow 23 (AY) with 1 azo group and Acid Black 1 (AB) with 2 azo groups. Various reaction parameters, i.e. type of dye, initial dye concentration, photocatalyst dosage, dissolved oxygen, initial solution pH, and water hardness concentration, were studied on the photocatalytic degradation performance. The experimental results showed that for the mixture of AY and AB, the λ_{max} values of both dyes from UV-visible spectroscopy did not change upon their mixing at different irradiation times during the course of photocatalytic degradation. The optimum conditions for the photocatalytic degradation were obtained at AY and AB concentrations of 5 and 2.5 mg/l and AY and AB concentrations of 2.5 and 5 mg/l, a photocatalyst dosage of 10 g/l, a dissolved oxygen of 37.7 mg/l, and an initial solution pH of 4.5, providing the highest degradation rate of the azo dyes. Moreover, the presence of water hardness as a mixture of Ca and Mg with a total concentration of 500 mg/l the most negatively affected the degradation performance. However, the pH adjustment could be used to significantly increase the photocatalytic degradation efficiency of the dyes present in the extremely hard water.

5.2 Recommendations

To further apply the synthesized mesoporous-assembled TiO_2 photocatalyst, the photocatalytic degradation of other dyes with more complex molecular structures should be investigated. The loading of an active cocatalyst, such as Pt, Au, and Ag, on the photocatalyst surface should also be studied for the system with high level of dye contamination since these loading metals are expected to enhance the photocatalytic degradation efficiency.