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 structure-directing surfactant and used to investigate the photocatalytic decomposition of MO, a model azo dye, as compared with commercially available non-mesoporous-assembled TiO_2 powders. The results of N_2 adsorption-desorption analysis revealed that the isotherms of the synthesized mesoporous-assembled TiO_2 photocatalyst showed typical IUPAC type IV pattern, indicating that the synthesized TiO_2 photocatalyst possessed mesoporous structure (mesopore size between 2-50 nm). On the other hand, the isotherms of the commercial TiO_2 showed typical IUPAC type II pattern, suggesting that the commercial TiO_2 possessed non-mesoporous structure. Various synthetic and reaction parameters, such as photocatalyst type, calcination condition for photocatalyst preparation, photocatalyst dosage, initial MO concentration, H_2O_2 concentration, initial solution pH, and Pt loading content, were studied on the photocatalytic MO decomposition performance. Among all investigated TiO_2 photocatalysts, the mesoporous-assembled TiO_2 calcined at a suitable temperature exhibited superior performance for MO decomposition to the non-mesoporous-assembled commercial TiO_2. The optimum conditions for photocatalytic MO decomposition were obtained as follows: a photocatalyst calcination temperature of 500°C, a photocatalyst dosage of 7 g/l, an initial MO concentration of 5 mg/l, a H_2O_2 concentration of 0.5 M, an initial solution pH of 4.7, and a Pt loading content of 0.6 wt.%, providing the highest photocatalytic MO decomposition.

5.2 Recommendations

To further apply the synthesized mesoporous-assembled TiO_2 photocatalyst, the photocatalytic decomposition of other dyes with more complex molecular structure or mixed dyes (competitive decomposition) should be investigated.

To prevent electron-hole recombination, deposition of noble metals has been employed to expedite electron transfer to outer surface for the decomposition reaction. In addition to the most investigated Pt, the other monometallic and bimetallic metals, such as Au, Pd, Ru, Ni, Cu, Pt-Au, Pt-Pd, Pt-Ru, Pt-Ni, and Pt-Cu, are also interesting for further study.