CHAPTER V
CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

In this research, the mesoporous-assembled In_2O_3-TiO_2 mixed oxide nanocrystal photocatalysts with various In_2O_3-to-TiO_2 molar ratios were synthesized by a sol-gel process with the aid of a structure-directing surfactant and used to investigate the photocatalytic degradation performance of Congo Red (CR) diazo dye. The synthesized mesoporous-assembled $0.05In_2O_3$-$0.95TiO_2$ mixed oxide photocatalyst showed a better photocatalytic CR degradation performance than the other In_2O_3-TiO_2 mixed oxide photocatalysts. The effects of various synthetic parameters, including calcination temperature and Ag loading, on the photocatalytic CR dye degradation performance of the mesoporous-assembled $0.05In_2O_3$-$0.95TiO_2$ mixed oxide photocatalyst were examined. The photocatalytic activity of the mesoporous-assembled $0.05In_2O_3$-$0.95TiO_2$ mixed oxide photocatalyst was found to strongly depend on the calcination temperature. In addition, the presence of Ag loaded on the mesoporous-assembled $0.05In_2O_3$-$0.95TiO_2$ mixed oxide photocatalyst could enhance the photocatalytic activity. The optimum Ag loading was found to be 1.5 wt.%, providing the highest photocatalytic CR dye degradation activity. Moreover, the presence of water hardness as a mixture of Ca and Mg negatively affected the photocatalytic CR dye degradation activity. However, the initial solution pH adjustment could be used to improve the photocatalytic degradation of the CR dye presented in the extremely hard water.

5.2 Recommendations

To further apply the synthesized mesoporous-assembled $0.05In_2O_3$-$0.95TiO_2$ mixed oxide photocatalyst, the photocatalytic degradation of other dyes with more complex molecular structure or mixed dyes (competitive decomposition) should be investigated.

To prevent electron-hole recombination and enhance the photocatalytic degradation performance, deposition of noble metals has been employed to expedite electron transfer to outer surface for the degradation reaction. In addition to the investigated Ag, the other monometallic and bimetallic metals, such as Pt, Ni, Cu, Pt-Ag, Pt-Ni, and Pt-Cu, are also interesting for a further study.