



## CHAPTER V

### CONCLUSIONS AND RECOMMENDATIONS

#### 5.1 Conclusions

In this research, the mesoporous-assembled  $\text{SrTi}_x\text{Zr}_{1-x}\text{O}_3$  and  $\text{SrTi}_x\text{Si}_{1-x}\text{O}_3$  nanocrystal photocatalysts with various Ti-to-Zr and Ti-to-Si molar ratios (as expressed by  $x$  in the  $\text{SrTi}_x\text{Zr}_{1-x}\text{O}_3$  and  $\text{SrTi}_x\text{Si}_{1-x}\text{O}_3$  where  $x = 0.89, 0.91, 0.93, \dots, 1$ ) were synthesized by a sol-gel process with the aid of a structure-directing surfactant and were used to investigate the hydrogen production from an aqueous solution of methanol (50 vol.%) under UV light irradiation. The Cu loading on the  $\text{SrTi}_x\text{Zr}_{1-x}\text{O}_3$  and  $\text{SrTi}_x\text{Si}_{1-x}\text{O}_3$  photocatalysts was performed by the photochemical deposition (PCD) method with the aim of photocatalytic activity enhancement. The synthesized mesoporous-assembled  $\text{SrTi}_{0.93}\text{Zr}_{0.07}\text{O}_3$  and  $\text{SrTi}_{0.95}\text{Si}_{0.05}\text{O}_3$  photocatalysts calcined at 700 °C possessed the highest photocatalytic hydrogen production activity than the other  $\text{SrTi}_x\text{Zr}_{1-x}\text{O}_3$  and  $\text{SrTi}_x\text{Si}_{1-x}\text{O}_3$  photocatalysts. Moreover, the 0.25 wt.% and 0.75 wt.% Cu loadings on the mesoporous-assembled  $\text{SrTi}_{0.93}\text{Zr}_{0.07}\text{O}_3$  and  $\text{SrTi}_{0.95}\text{Si}_{0.05}\text{O}_3$  photocatalysts significantly enhanced the photocatalytic hydrogen production activity, respectively. In comparison, the 0.75 wt.% Cu-loaded  $\text{SrTi}_{0.95}\text{Si}_{0.05}\text{O}_3$  photocatalyst provided much higher hydrogen production activity than the 0.25 wt.% Cu-loaded  $\text{SrTi}_{0.93}\text{Zr}_{0.07}\text{O}_3$  photocatalyst.

#### 5.2 Recommendations

In order to enhance the hydrogen production activity, the other types of mixed oxide photocatalysts, such as  $\text{TiO}_2\text{-In}_2\text{O}_3$  and  $\text{TiO}_2\text{-ZnO}$ , with other loaded metals, such as Ag, Cr, La, Ni, and Pt, are also interesting to be investigated in a further study.