CHAPTER VI

CONCLUSION AND RECOMMENDATION

6.1 Conclusion

In this work, we studied properties of TiO_2 aerogel and xerogel, which were prepared by a sol-gel method with either ethanol or methanol as a solvent, followed by subsequent supercritical drying (aerogel) or drying at ambient atmosphere (xerogel) and heat treatment at a temperature in the range of 350-600 ^{o}C. The photocatalytic activities of TiO_2 aerogel and xerogel were investigated for photocatalytic oxidation of ethylene in gas phase. Conclusions of the study are summarized as follows:

1. The specific surface area and pore volume of as-synthesized aerogel was significantly greater than those of xerogel. However, more organic compounds remained in as-synthesized aerogel than in as-synthesized xerogel.

2. The phase transformation from amorphous to anatse and from anatase to rutile for the aerogel occurred at a higher temperature than xerogel in the both solvent. The type of solvent had no significant effect on the phase transformation of titanium dioxide.

3. TiO_2 aerogel contained more Ti^{3+} surface defect than that xerogel did because of more organic residues present in the aerogel.

4. TiO_2 that used ethanol as a solvent during preparation exhibited the maximum photocatalyitc activities at 400 ^{o}C, while the maximum photocatalyitc activities of TiO_2 that used methanol as a solvent during preparation occurred at 500 ^{o}C.

5. The photocatalytic activities did not depend on specific surface area but was influenced by the amount of Ti^{3+} surface defect and the crystallinity of anatase in TiO_2 in our case.

6.2 Recommendations for future studies

1. In this work, the results show that the crystallinity of TiO_2 had an effect on its photcatalytic activity. Therefore, one may attempt to prepare TiO_2 aerogel by high-temperature supercritical drying.
2. Other applications for TiO_2 aerogel such as oxygen sensor or dye-sensitized solar cell should be explored.