# CHAPTER VI
# CONCLUSIONS AND RECOMMENDATIONS

## 6.1 Conclusions

The conclusions emerged from this research are the following:

1. The physical properties, i.e., crystal size and surface area can be controlled by choice of organic solvents and volume ratio of 1,4 butanediol and 2-propanol. The results show that titanium (IV) oxide which is synthesized from volume ratio of 1,4 butanediol to 2-propanol of 0:5 has the largest crystal size (42 nm). On the other hand, titanium (IV) oxide synthesized from volume ratio of 1,4 butanediol to 2-propanol of 2:3 has the smallest crystal size (10.3 nm). All of the synthesized titanium (IV) oxide catalysts characterized by XRD technique confirms that resulting titanium (IV) oxide contain only anatase phase.

2. There is an optimal crystal size of $TiO_2$ for gas-phase photo-oxidation of 2-propanol. For this study crystal size of 23.2 nm give the highest photocatalytic degradation of 2-propanol to carbon dioxide and water. Vice versa, the smaller and larger crystal sizes show lower photoactivity due to the effect of electron-hole recombination process and 2-propanol adsorbability on the surface of catalyst.

## 6.2 Recommendations

From the present work, the following recommendation for the future studies is proposed.

1. We know that the physical and chemical properties of the titanium (IV) oxide have the effects on the gas phase photo-oxidation of organic compound. Modified $TiO_2$ catalysts such as adding the dopants, $Cu^{2+}$, $Ni^{2+}$, or silica have different those properties. Therefore, the next interesting study may determine the

optimum transition metal ion dopants for gas phase photo-oxidation reaction of 2-propanol to improve the $TiO_2$ photocatalyst.

2. From figure 5.16, it shows that the data between 2-propanol adsorbability of about 0.1 and ca. 0.2 does not have the data for giving the tendency. So this is interesting point for determining the additional data in that intervals.