CHAPTER V
CONCLUSIONS AND RECOMMENDATIONS

In this thesis work, glycolato titanium was synthesized directly from inexpensive starting material, titanium dioxide and ethylene glycol via the Oxide One Pot Synthesis (OOPS) process in the presence of TETA. The obtained products were characterized using TGA, NMR, EA, MS and FTIR. From TGA result, the ceramic yield of the product was 46.95 %, which was closed to the theoretical yield (47.56 %). 13C-NMR also confirmed the tetracoordination on Ti atom. EA, MS and FTIR results confirmed the product was the expected glycolato titanium. This product exhibited outstanding high stability in alcohol, water, and also high moisture resistant.

The phase transition and morphology of glycolato titanium was also observed using XRD and SEM, respectively. They were found that the well-resolved anatase phase appeared at the temperature around 900 °C, and the single phase of rutile was obtained at 1100 °C.

As for the sol-gel studies, the transformations of glycolato titanium to glycolato titanium gel was carried out using a cone and plate rheometer to observe and determine gelation times and rate of transformation reactions. The results indicated the shortest gelation time was obtained at ratio of 35: 125, which was the lowest acid and water ratio. The gelation times were increased with the increasing acid and water ratios. During sol-gel processing, the gelation rate was highest at intermediate acid: water ratios and slowest at low and high ratios. This appears to arise because increase in acidity enhances the rate of hydrolysis, but can also inhibit the rate of condensation. Moreover, the surface area of titania powder after pass through sol-gel process was found; the ratio of 35: 125 at 600 °C gave the highest surface area (125 m^2/g). The surface area was decreased with the increasing of acid and water ratios. As compared the calcination temperatures, the lower surface area will be obtained at higher temperature, indicating the heavily densification or agglomeration of titania powder. This thesis work reveals that a longer gelation time increases the crystal size and decrease the surface area.

From this thesis work, glycolato titanium was prepared by inexpensive method. This precursor was suitable to control microstructure of titania under sol-gel process due to its properties. The suitable sol-gel conditions of glycolato titanium obtained can be applied to many applications such as photocatalysts, films or membranes. In the next step, titania can be loaded with Pt, Ag, Fe, ZnO and CdS to improve photoactivity upon the condition of the sol-gel process. Moreover, titania can be used for solving environmental problems for instance silica can be embedded in titania particles by sol-gel process for decomposition of trichloroethylene.