CHAPTER VI
CONCLUSIONS AND RECOMMENDATIONS
FOR FUTURE RESEARCH

This research has investigated the effect of TiO_2 with the addition of alumina or magnesium oxide on the performance of dye-sensitized solar cell. In this chapter, section 6.1 provided the conclusion that obtained from the experimental results of the effect of the modification of TiO_2 electrode layer by adding Al_2O_3 and MgO, the effect of sintering temperature, effect of thickness of TiO_2 electrode layer for single-layer and double-layer TiO_2 films on the performance of dye-sensitized solar cell. Additionally, recommendations for future study are presented in section 6.2.

6.1 Conclusion

6.1.1 Modification of TiO_2 electrode layer by adding Al_2O_3

The modification of the TiO_2 electrode layer by different amount of Al_2O_3 by weight altered the performance of dye-sensitized solar cell. The surface area of TiO_2 after the addition of alumina also has a lot more basicity. Resulting dye molecules (with a group carboxylate acid) adhesive on the surface more. Lead to improved short circuit current density and the efficiency of the cells when compared to cells with only TiO_2. The 1% (wt %) of Al_2O_3/TiO_2 electrode sintered at 400 °C for two hours at thickness of film was 10.5 μm gave the best efficiency of cell of 5.04±0.2%.

6.1.2 Modification of TiO_2 electrode layer by adding MgO

The effect of adding magnesium oxide the surface of titanium dioxide after the addition the acidity increased. The amount of dye absorption decreased, resulting in reduced short circuit current density and efficiency of the cell decreased when compared to cells with only TiO_2.

6.1.3 Effect of sintering temperature on mixed oxide electrode layer

The photovoltaic parameters of DSSC depend on sintering temperature, it was found that a maximum of short-circuit current density with a DSSC with a TiO_2 added alumina 1% (wt %) electrode sintered at 400°C for 120 minutes. The highest cell efficiency of 5.04±0.2%.

6.1.4 Double-layered TiO_2 electrode

Double-layered TiO_2 electrode was fabricated to increase the light scattering and dye adsorption. The photoelectrochemical properties of the double layer structure were improved and the overall energy conversion efficiency was enhanced from 5.04±0.2% to 5.50±0.5%.

6.2 Recommendations for future studies

From the previous conclusions, the following recommendations for future studies are proposed.

1. Improving efficiency of dye-sensitized solar cell by optimizing fabrication procedure.
2. Improving of the light harvest efficiency of dye-adsorbed TiO_2 electrodes by multi-layer (using a TiO_2 layer higher surface area increases the dye adsorption).
3. Improving the surface of TiO_2 electrode with other metal oxide.