# CHAPTER V

# CONCLUSIONS AND RECOMMENDATION

## 5.1 Conclusions

In this thesis, it was demonstrated that the transparent zinc oxide incorporated with polyelectrolyte films were fabricated from dipping a glass substrate coated with a single bilayer polyelectrolyte film into ZnO precursor solution with layer-by-layer dip coating technique. The pH of the ZnO precursor solution for preparation ZnO thin film is adjusted to be 1. The photoinduced hydrophilic property of the fabricated films were investigated, its dependence on pH of precursor sol. However, the suspension of ZnO in PAA would be used for preparation of the transparent ZnO incorporated with polyelectrolyte film. This method could be agglomeration of ZnO. Its problem to using a long time period to activate surface defective site leading to the most water contact angle that mean the lower hydrophilic property.

In part A, effect of polymer concentration, withdrawal speed (WS) and number of dipping cycle were explore to find out the appropriate condition to prepare the sufficient film thickness with smooth surface. It was found that the number of bilayer polyelectrolyte film that suitable for deposition ZnO into the film was 1 bilayer which was prepared from 2.0 M PAH/PAA (as poly(allylamine hydrochloride), PAH and poly(acrylic acid), PAA) with withdrawal speed 3 cm/min and drying at the temperature of 180°C.

Regarding to improve the photoinduced hydrophilic property of ZnO incorporated with polyelectrolyte film coated on glass substrate, influence of the methodology for depositing ZnO were experimentally investigated in Part B. As experimental results, the ZnO incorporated with polyelectolyte film prepared by sol-gel method at pH of precursor about 1 exhibited the water contact angle lower than 5 degree after UV irradiation for 15 min. It still exposed to be lower than 5 degree as the increased UV irradiation time from

15 to 60 min. Although, the suspension of ZnO in PAA was easily to deposite ZnO into the etched polyelectrolyte film but it was not suitable for improving the hydrophilic property of the film. This method would not provide the distribution of ZnO into the film due to the ZnO agglomeration through reaction between ZnO and poly(acrylic acid) solution. Moreover, the precipitation method could not be a suitable method for improving the photoinduced hydrophilic property of ZnO incorporated with polyelectrolyte film.

## 5.2 Recommendation for future work

5.2.1 To investigate effect of number of sol-gel ZnO coating layer on improvement photoinduced hydrophilic property.

5.2.2 To investigate ZnO thin film durability after being kept in dark storage.