CHAPTER VI

CONCLUSION AND SUGGESTION

6.1. Conclusion

In this research, two catalytic systems: homogeneous and heterogeneous were used for the polymerization of styrene. Polymer-supported titanocene catalysts have been synthesized using $CpTiCl_3$ and Cp^*TiCl_3. Two types of cocatalysts : methylaluminoxane (MAO) and boron compound, $[PhNMe_2H][B(C_6F_5)_4]$ were used. When considering the titanium catalyst, the results show that polymer-supported Cp^*TiCl_3 catalyst exhibits a higher catalytic activity than polymer-supported $CpTiCl_3$ catalyst. This can be explained that the catalytic activity is enhanced by electron-releasing substituents (methyl) on the Cp^* ligand.

The results which compared the cocatalysts show that polymer-supported Cp^*TiCl_3–MAO system (or P-Cp^*TiCl_3-MAO) exhibits a higher catalytic activity than polymer-supported Cp^*TiCl_3–$[PhNMe_2H][B(C_6F_5)_4]$ system (or P-Cp^*TiCl_3-boron). The optimum condition for both systems is: 87 mmol of styrene, polymerization temperature of 70°C and polymerization time of 4 h. For P-Cp^*TiCl_3-MAO, the optimum amount of Ti is 0.1000 mmol. Al/Ti molar ratio of 300 whereas it is 0.0100 mmol with Al/Ti molar ratio of 200 for P-Cp^*TiCl_3-boron system.

The results which compared the preparative method of polymer-supported $CpTiCl_3$ catalysts show that treating the polymer bead with MAO and the catalyst (method B) is a better way than treating the bead with an amine, then MAO and the catalyst (method A).

Tacticity of the obtained polystyrene is syndiotactic, which revealed by the ^{13}C NMR technique. Moreover, the result from SEM demonstrated that the morphology of polystyrene is a replica of support particles.

It can be seen that the heterogeneous metallocene catalysts exhibit lower catalytic activities than their corresponding homogeneous systems. This behavior might be due to the steric hindrances of active species on the support surface during polymerization and the deactivation of active metal sites during the supporting process.

6.2. Suggestion for the future work

1. The molar ratio of Al/Ti that used for preparation of polymer-supported titanocene catalyst should be further investigated.

2. The polymer-supported titanocene catalysts should be used for the copolymerization, e.g. ethylene and styrene.