

CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

From the discussed results in the previous chapter, it can be concluded that:

- 1 The increased Al/Ti ratio resulted in an increase of activity, which was gradually increased with more Al/Ti ratio, and a slight decrease of isotactic index.
- 2 Adding small amounts of external donor resulted in a significant increase of activity and then decreased with increasing more external donor but isotactic index increased with increasing De/Al ratio.
- 3 An increase in hydrogen content caused an increase in activity and a decrease in isotactic index.
- 4 IBIPDMS was the best for activity and good for isotactic index with little lower than DIPDMS.
- 5 Addition of cocatalyst, external donor or hydrogen had no significant effect on melting temperature (T_m). However, T_m of all external donors was higher than without external donor.

- 6 Addition of cocatalyst, external donor or hydrogen had no significant effect on crystallization temperature (T_c). However, T_c of all external donors was higher than without external donor.
- 7 MFR decreased with increasing De/Al and seemed to increase slightly with increasing Al/Ti. As addition of hydrogen, MFR significantly increased. MFR of polymer without external donor was very high comparing to polymer with external donor. An order of MFR was following.
 NODONOR > DIBDMS > CHMDMS > IBIPDMS > DIPDMS > DCPDMS
- 8 \overline{M}_n and \overline{M}_w changed with Al/Ti ratio and also with De/Al ratio. For hydrogen adding, \overline{M}_n and \overline{M}_w decreased with all kind of external donors and without external donor but $\overline{M}_w/\overline{M}_n$ had no clear effect.

5.2 Recommendations for Future Work

From the finding of propylene polymerization using heterogeneous Ziegler-Natta catalyst in this research, future studies should be the effect of external silane donors on Ziegler-Natta catalyst for polymerization of propylene copolymer. Homopolymer is useful for many applications such as fibers, pipes, and injection molding but for some applications the homopolymer is too rigid and the transparency is low. To obtain the application item of this polymer, a higher flexibility and clarity are desirable. The copolymer can achieve these properties by polymerizing propylene with another monomer such as ethylene and butene-1, which is the most commercial used, to produce polypropylene copolymer.