CHAPTER V

CONCLUSIONS AND FUTURE DIRECTION

5.1 Conclusions

This study focuses on the copolymerization of L-lactide and glycidol using two reaction schemes and various initiators: $Mg(OEt)_2$, $Al(O^iPr)_3$, $SnPh_4$, $Sn(Oct)_2$, KO^tBu, and $BF_3{\cdot}OEt_2$ The first scheme was to prepare random copolymers by adding the two monomers together. Not much success was achieved, because the products obtained contained mixtures of oligomers and monomers that could not be purified to obtain well-defined species.

The second polymerization scheme was to synthesize block-copolymers. This was done by first polymerizing glycidol using $BF_3{\cdot}OEt_2$ The resulting branched polyglycidol was then used in conjunction with $Sn(Oct)_2$ to initiate ring-opening of L-lactide. The molecular weight of the branched PLLA-*b*-PG copolymer was as high as 14,600 Da when the mole ratio of LLA:PG reached 60:1. The molecular weight, polydispersity index, and yield of the copolymer were not effected by the amount of $Sn(Oct)_2$ (10 or 20 mol% of the total hydroxyl groups in PG).

In addition, a block of linear polyglycidol was synthesized by using benzyl glycidyl ether, a hydroxy-protected glycidol, as a monomer and $BF_3{\cdot}OEt_2$ as an initiator. The linear PG was then used to initiate the ring-opening polymerization of L-lactide to make a linear-block copolymer of LLA and G with molecular weight of 1,184 Da.

Structures of all polymers were characterized by proton, carbon and COSY-NMR spectroscopy. Model ester derivatives were used to confirm the assignment of primary and secondary alkyl ester signals in NMR spectra of these LLA and G copolymers.

5.2 Future Direction

This work covers only the synthesis of LLA and glycidol copolymers. One of the tasks needed to be completed is to study various properties of the polymers, *e.g.* solubility, degradation profile, thermal, and mechanical properties. In addition, more experiments are necessary to optimize the polymerization condition of the linear block copolymer, starting from the GBn (protected glycidol). Differences between the core-shell and linear structures should also be explored in order to find a suitable application in biomedical field for this LLA-glycidol copolymers.

ศูนย์วิทยทรัพยากร
จุฬาลงกรณ์มหาวิทยาลัย