

## CHAPTER V

### CONCLUSIONS AND FUTURE DIRECTION

#### 5.1 Conclusions

Block copolymer of L-lactide and glycidol was synthesized by ring-opening polymerization of L-lactide using polyglycidol and Sn(Oct)<sub>2</sub> as a macroinitiator and catalyst, respectively. Polyglycidol was first prepared by polymerizing glycidol using BF<sub>3</sub>·OEt<sub>2</sub>. The resulting branched polyglycidol was then used in conjunction with Sn(Oct)<sub>2</sub> to initiate the ring-opening of L-lactide monomer. The molecular weight, polydispersity index, and yield of the block copolymer depended on reaction temperature, reaction time, and LLA:G feed ratio but were not effected by the amount of Sn(Oct)<sub>2</sub>. The suitable condition of ROP of LLA with PG macroinitiator was carried out at 130°C for 1 day in bulk, using 5 mol% of Sn(Oct)<sub>2</sub> (compared to the total content of hydroxyl group in PG). The structures of all polymers were characterized by proton, carbon and COSY-NMR spectroscopy. The obtained PLLA-*b*-PG showed lower  $T_g$  than PLLA homopolymer. The  $T_g$  value was in the range of 14 to 48 °C. The copolymer was more hydrophilic than homo PLLA. The hydrophilicity was found to decrease with the increasing of LLA content in the copolymer as determined by air-water contact angle measurement. The structure of PLLA-*b*-PG copolymer was most likely to be in the form 'core-shell' structure. The inner branched PG represents hydrophilic core while the outer PLLA represents hydrophobic shell. The results of degradation study revealed that the changes in molecular weight of the copolymer took place at a slower rate than homo PLLA, while weight loss was found to be faster. Based on a number of results, it was suspected that homo PLLA was also present in the copolymer.

## 5.2 Future direction

This work has one problem that different polymeric species including homo PLLA might occur during the copolymerization. One of the tasks needed to be completed is to separate the homopolymer from the copolymers by extraction or fractionation using column chromatography. The block copolymers, which have hydrophilic and hydrophobic segments' should also be further explored in order to find a suitable application in biomedical field.