CHAPTER IV

CONCLUSION AND SUGGESTIONS FOR FURTHER WORK

4.1 Conclusion

Three important goals have been achieved in this research. Firstly, a hexadentate Schiff base zinc complex (ZnL_1) have been synthesized. The chemical structure of ZnL_1 was identified by FTIR, ^1H NMR, ^{13}C NMR, elemental analysis and X-ray crystallography. X-ray crystallography indicated that ZnL_1 has a roof-shaped structure with the slope that contains benzene rings and the zinc atom, which adopts a distorted octahedral geometry. The mesogenic and thermal properties investigated by DSC, TGA and POM showed that ZnL_1 is a metallomesogen in the temperature ranges from 220-230 $^{\circ}C$.

Secondly, derivatives of ZnL_1, namely ZnL_2 and ZnL_3 have been synthesized and characterized by FTIR, ^1H NMR, ^{13}C NMR and elemental analysis in order to study the reactivity of ZnL_1 for further polymerization and to examine the changes in liquid crystallinity that could occur due to the introduction of flexible or rigid substituent to the rigid structure of ZnL_1. The results showed that both ZnL_2 and ZnL_3 exhibited monotropic liquid crystals in the temperature ranges of 120-200$^{\circ}C$ and 145-200$^{\circ}C$, respectively.

Finally, four types of polyurethanes that contained ZnL_1 unit in the main chain, namely PU_1ZnL_1, PU_2ZnL_1, PU_3ZnL_1 and PU_4ZnL_1 have been synthesized. All synthesized polyurethanes were characterized by FTIR. Their thermal and mesogenic properties were indicated by DSC, TGA and POM. Under the observation of a polarizing microscope equipped with a heating stage, polyurethanes

based on hexamethylene diisocyanate (PU_1ZnL_1 and PU_2ZnL_1) showed monotropic liquid crystal phase between temperature ranges of 170-220°C and 170-200°C, respectively. But no birefringence was found during heating polyurethanes based on toluene diisocyanate (PU_3ZnL_1 and PU_4ZnL_1). The thermal analysis results of metallomesogen, its derivatives and polyurethanes are listed below.

Sample code	Mesophase ranges [a]	Weight loss temperature (°C) [b]			
	Tm – Ti (°C)	5%	10%	20%	30%
ZnL_1	220-230	90	280	380	490
ZnL_2	120-200	200	230	260	280
ZnL_3	145-200	200	230	250	270
PU_1ZnL_1	170-220	240	270	335	410
PU_2ZnL_1	170-200	180	245	280	320
PU_3ZnL_1	-	240	270	340	400
PU_4ZnL_1	-	200	245	280	310

a : observed by polarizing optical microscope

b : data obtained from thermalgravimetric analysis

4.2 Suggestions for future work

It is well known that hard segment of thermotropic polyurethane elastomers can form thermotropic liquid crystalline phase when properly selected diisocyanate and diol are used. Therefore, the suggestion for future work is to synthesize metal-containing thermotropic liquid crystalline polyurethane elastomers with different kinds of diisocyanates and diols at different compositions. Moreover, several transition metal compounds with usual shapes and high coordination numbers have been reported to exhibit liquid crystallinity. Further research could also concentrate on the synthesis of liquid crystalline polyurethane elastomers based on different transition metal complexes.