

CHAPTER V

CONCLUSION AND SUGGESTION FOR FUTURE WORK

5.1 Conclusion

Copolyurethane-ureas were synthesized using polymerization of 4,4'-dihydroxysaltrien metal complexes (ML, where $M = Zn^{2+}$ and Ni^{2+}), 4,4'-methylenebis(phenyl isocyanate) (MDI) and various diamines or dialcohols, namely methylenedianiline (MTDA), hexamethylenediamine (HMDA), bisphenol A (BA) and 1,6-hexanediol (HD).

The structures of metal-containing copolyurethane-ureas were characterized by IR and NMR. The metal-containing copolyurethane-ureas were soluble in DMF and DMSO but insoluble in most of organic solvents. Zinc-containing copolyurethane-ureas showed higher solubility than nickel-containing copolyurethane-ureas. The inherent viscosity of metal-containing copolyurethane-ureas was found to be in the range 0.0910-0.1700 dL/g. Thermal properties of metal-containing copolyurethane-ureas were investigated by TGA, DSC and LOI. TGA results showed that nickel-containing copolyurethane-ureas had higher thermal stability than zinc-containing copolyurethane-ureas. The char yield at 600 °C of nickel-containing copolyurethane-ureas and zinc-containing copolyurethane-ureas was found to be in the range 35-54% and 30-46%, respectively.

Among all zinc-containing copolyurethane-ureas, ZnL-MDI-BA (1.0:3:1.0) and ZnL-MDI-HD (1.0:3:1.0) were found to be the most thermally stable copolyurethane-ureas, which was higher than that of ZnL-MDI. The presence of diamines and dialcohols in the nickel-containing copolyurethane-ureas did not increase their thermal stability which might be because NiL-MDI already had good thermal stability. It was found that the initial decomposition temperature (IDT) of metal-containing copolyurethane-ureas were higher than those of metal-containing polyurethane-ureas. From the DSC data, it was found a single glass transition temperature of the copolyurethane-ureas were in the range 160-192. The limiting oxygen index (LOI) values of the copolyurethane-ureas were in the range 21.6-23.6.

5.2 Suggestions for future work

Since it was found that thermal stability and solubility of zinc-containing copolyurethane-ureas was improved upon the addition of bisphenol A or 1,6-hexanediol, the suggestion for future work is to synthesize zinc-containing copolyurethane-ureas with different dialcohols such as 2,3-naphthalenediol or 4,4'-biphenyldiol.