

CHAPTER IV

CONCLUSION AND SUGGESTION FOR FUTURE WORK

4.1 Conclusion

Part I Syntheses of NiL₁, NiL₂, PU₁NiL₁ and PU₂NiL₁

We have been able to synthesize hexadentate Schiff base nickel complex NiL₁ and its derivative (NiL₂). NiL₂ was used to investigation of reactivity of the amine group in NiL₁. The results shown that the complete reaction condition was 80 °C / 12 hours for the mole ratio of NiL₁: hexyl isocyanate = 1:2

Furthermore we have been able to incorporate NiL₁ into polyurea and polyurethane. That is, nickel-containing polyurea (PU₁NiL₁) and nickel containing polyurethane (PU₂NiL₁) were synthesized. The progress of polymerization was monitored by using IR spectroscopy. It was found that the complete polymerization condition of PU₁NiL₁ was 80 °C / 12 hours for the mole ratio of NiL₁: hexamethylene diisocyanate = 1.1:1 and the complete polymerization condition of PU₂NiL₁ was 80°C / 18 hours for the mole ratio of NiL₁: prepolymer = 1.1:1.

The chemical structure of NiL₁, NiL₂, PU₁NiL₁ and PU₂NiL₁ was identified by FTIR and elemental analysis.

Part II Thermal behavior of NiL₁, NiL₂, PU₁NiL₁ and PU₂NiL₁

Thermal properties of NiL₁, NiL₂, PU₁NiL₁ and PU₂NiL₁ were investigated by using differential scanning calorimetry (DSC) and thermogravimetric analysis (TGA). DSC thermogram of NiL₁ showed a large endotherm around 106 °C and two small endotherms around 260 °C and 285.6 °C, respectively, NiL₂ showed two small endotherms around 63 °C and 236 °C. DSC thermogram of PU₂NiL₁ showed the endothermic peak at 127.9 °C. But in the case of PU₁NiL₁, DSC thermogram showed an exothermic at 228 °C peak that might be due to crosslinking reaction of PU₁NiL₁.

After heating PU_1NiL_1 at 228°C for 1 hour, IR of the crosslinked PU_1NiL_1 was obtained in the similar pattern as PU_1NiL_1 . Additionally DSC thermogram of crosslinked PU_1NiL_1 showed the absence of exothermic peak at 228°C . Therefore, from IR and DSC experiments, it was possible to conclude that the PU_1NiL_1 underwent crosslinking reaction after heating.

From TGA curve, the result was suggested that PU_2NiL_1 had higher weight loss percentages than PU_1NiL_1 . This might be due to the stabilization by hydrogen bonding in PU_1NiL_2 . In addition, DSC thermogram of PU_2NiL_2 did not show the exothermic crosslinking, which may be explained that PU_2NiL_2 contained less NHCO group than PU_1NiL_1 .

4.2 Suggestion for future work

The suggestion for future work is to synthesize metal-containing polyurethanes with difference of diisocyanates and diols. Moreover, the different transition metal complexes should give different property of metal-containing polyurethanes. Therefore, further research could also concentrate on the synthesis of metal-containing polyurethane based on different transition metal complexes.

ศูนย์วิจัยทรัพยากร
จุฬาลงกรณ์มหาวิทยาลัย