

## CHAPTER 5

### CONCLUSION AND SUGGESTION

#### 5.1 Conclusion

Natural rubber can be partially hydrogenated by using  $\text{RuCl}_2(\text{PPh}_3)_3$  as a homogeneous catalyst in toluene as the solvent. The effect of temperature,  $\text{H}_2$  pressure, reaction time, and catalyst amount were investigated, FT-IR and NMR spectroscopy were employed to characterize the molecular structures of natural rubber and hydrogenated natural rubber. The percentage of hydrogenation of natural rubber was measured by NMR analysis. The appropriate conditions for hydrogenating 0.5 g natural rubber in toluene 50 ml was found to be at the temperature of  $100^\circ\text{C}$ , hydrogen pressure of 30 bar for 24 hours by using 0.09 g  $\text{RuCl}_2(\text{PPh}_3)_3$ . This condition yielded 63% hydrogenated natural rubber.

Molecular weight and molecular weight distribution were studied by GPC. Hydrogenated natural rubbers had lower molecular weight and narrow molecular weight distributions than natural rubber

The thermal properties of hydrogenated natural rubber were better than natural rubber as analyzed by TGA and DSC. Thermal stability and  $T_g$  of hydrogenated natural rubber were improved.  $T_g$  of hydrogenated is  $1\text{-}2^\circ\text{C}$  higher than that of natural rubber. It was shown that hydrogenation increased thermal stability of the natural rubber without highly affecting its glass transition temperature.

## 5.2 Suggestion for Future Work

In the area of modification of natural rubber, further study should be given to the following aspects:

The remaining unsaturated carbon in the partial hydrogenation natural rubber should be further modified, for example, by epoxidation, in order to improve the thermal stability of the rubber.



ศูนย์วิทยทรัพยากร  
จุฬาลงกรณ์มหาวิทยาลัย