

3836543 SCPO/M : MAJOR : POLYMER SCIENCE; M.Sc. (POLYMER SCIENCE)

KEY WORDS : AROMATIC SUBSTITUTION, POLYSTYRENE,
CHEMICAL MODIFICATION, LEWIS ACID, ACYLATION

PORNTIP NGAMPIMANMAN : FUNCTIONALISATION OF
POLYSTYRENE VIA FRIEDEL-CRAFTS ACYLATION AND ITS
CHARACTERISATION. THESIS ADVISORS : PRANEE PHINYOCHEEP,
Doctorat de l' Université du Maine, TAWEECHAI AMORNSAKCHAI, Ph.D.,
KALYANEE PREMPIHET, Ph.D., 107 p. ISBN 974-661-764-8

Polystyrene (PS) is a commodity polymer which possesses unique properties. In this study, functionalisation of the PS with succinic anhydride (SA) and maleic anhydride (MA) on aromatic side via *Friedel-Crafts acylation* was investigated. The acid function fixed on the PS is of particular interest as it has a potential reaction with other polar polymer like polyamide. The Friedel-Crafts acylation was carried out under nitrogen atmosphere at room temperature ($\sim 33^\circ\text{C}$) and 85°C in the presence of various types of Lewis acid catalysts, i.e. FeCl_3 , AlCl_3 , $\text{BF}_3\text{O}(\text{C}_2\text{H}_5)_2$. The functionalised polystyrenes were characterised by IR, $^1\text{H-NMR}$, $^{13}\text{C-NMR}$, GPC, DSC, TGA, and elemental analysis. For SA and MA as acylating agents, the acylated polystyrenes contained $-\text{CO}-\text{CH}_2-\text{CH}_2-\text{COOH}$ and $-\text{CO}-\text{CH}=\text{CH}-\text{COOH}$ fragments in side chains of the PS, respectively. The acylation was found to occur randomly at *para*-substituted PS. It was found that the modified polymer had lower molecular weight than the starting material because of degradation which occurred as a side-reaction. The degree of acylation was found to be dependent on the types and amount of catalyst and the molecular weight of PS. The effect of catalysts on the acylation was observed and it could be concluded that catalysts' activities in the reactions studied was as follows: $\text{FeCl}_3 < \text{AlCl}_3 < \text{BF}_3\text{O}(\text{C}_2\text{H}_5)_2$. The content of the acyl fragments increased with increasing the amount of catalyst and with reducing the molecular weight of the PS used. T_g of the modified polystyrenes significantly increased as compared to the starting PS. This may be due to the interaction between the acyl fragments attached in molecular chain. TGA and IR studies of the acylated polystyrenes after thermotreatment at 160°C indicated that decarboxylation of carboxyl groups in the acyl fragments could occur at high temperature.