

CHAPTER VI

CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

The present investigation involved the phase diagrams of polystyrene (PS) blended with HP35 or HP5N and poly(bisphenol-A-carbonate) (PC) blended with HP35 or HP5N. The phase diagrams were constructed by the method developed in this study, i.e. the method of depression trend and the gradient method. The number of conclusions from the results of this work can be summarized as follows:

1. The phase diagram of PS blended with HP35 (system I) is likely to show the upper critical solution temperature (UCST) behaviour, i.e. the miscibility of the blends increases with increasing temperature. The blends under 12.7 percent by weight of HP35 with PS exhibit partially miscible behaviour. However, at higher temperatures (87 - 120°C), the partially miscible region tends to increase from 12.7 percent by weight of HP35 with PS. This follows the pattern of UCST behaviour.
2. In the system of PS blended with HP5N (system II), the blends under 5.0 percent by weight of HP5N, are partially miscible. Moreover, the partially miscible region (at 10.0 - 15.0 percent by weight) appears among immiscible

regions (from 5.0-10.0 percent by weight and from 15 percent by weight upward). This observed phase behaviour could be the specific nature of this system in the low concentration side of HP5N.

3. The phase diagram of PC blended with HP35 (system III) seems to be the convergence of upper and lower critical boundaries. This type of phase diagram can be in the form of an hourglass-shaped phase boundary. The blends under 15.0 percent by weight of HP35 with PC exhibit partially miscible behaviour.

4. The phase diagram of PC blended with HP5N (system IV) seems to be the immiscible loop with upper and lower critical phase boundaries inverted. The blends under 20.0 percent by weight of HP5N with PC exhibit partially miscible behaviour.

5. The phase diagrams constructed by the method of depression trend and the gradient method for each system have basically the same estimated phase boundary. The slight difference of the estimated phase behaviour between the two phase diagrams (at some annealed temperatures and/or liquid crystal concentrations) is due to more information provided by the gradient method.

6. Both HP35 and HP5N can act as plasticizers for PS and PC as evidenced by the decreasing in the glass transition temperatures (T_g) of PS and PC.

7. Both HP35 and HP5N are more compatible with PC than PS. This conclusion is deduced from the results that the blends of HP35/HP5N with PC exhibit partially miscible behaviour over a broader concentration range than the blends of HP35/HP5N with PS.

6.2 Recommendations for Further Studies

1. Transmission Electron Microscopy (TEM) should be used to verify the phase behaviour in the constructed phase diagrams because of its high resolution (below 1 nm: [Gedde, 1995]). Although the sample preparation for TEM is more difficult than the scanning electron microscope (SEM).
2. The concentration range of the low molar mass liquid crystal in the blends studied in this work should be extended up to 100% by weight if possible in order to verify the phase diagram type. The annealing temperature should cover from sufficient low temperature (i.e. room temperature) up to above T_g of the pure polymer but not too high to cause degradation of polymer.
3. It should be interesting to study the effects of low molar mass liquid crystal on the viscosity and mechanical properties of the blend. This information may provide some guideline in modifying the mechanical properties of pure polymer.