CHAPTER IV
CONCLUSIONS

Our work is the first investigation of the P(S-b-I) diblock copolymer content effect on the alpha transition temperature of PS/PI blends and PPO/PI blends. In the case of PS/P(S-b-I)/PI blends, there is no observable change in the alpha transition temperature with additions of 1-5 wt % of the diblock copolymer. In the case of PPO/P(S-b-I)/PI blends, we observed a shift in the alpha transition temperatures of the blends with 1-5 wt % diblock copolymer. This is largely due to the exothermic heat of mixing between the PPO homopolymer and the PS segment of the diblock copolymer. PS segment can penetrate more easily into PPO matrix than into PS matrix.

For the Young's modulus measurements of the PS/PI blends in the glassy/rubbery state, an increase was formed with diblock content initally (0-2 wt %) until a maximum was reached, then a increase toward an asymptotic value. The initial increase is definite evidence for effective compatibilization. The subsequent decrease is probably due to a saturation of the interface by block copolymer and formation of micelles at higher block copolymer concentration. For the PPO/PI blends in the glassy/rubbery state, the Young's modulus increases monotonically with the diblock copolymer content. This suggests that the exothermic interaction for this system enhances entropic swelling on the PS/PPO side and the formation of micelles is postponed. A qualitatively similar Young's modulus result was obtained for each blend when the measurement temperature was reduced so that the blend was in the glassy/glassy state. The slight difference stems from the case of disentanglement on the PI/PI side of interface.

The yield stress can be improved slightly with addition of diblock polymer into PS/PI blends. On the other hand, a monotonic increase in yield stress can be obtained with the addition of a diblock copolymer into PPO/PI blends. This result suggests that initiation of disentanglement can be influenced by the exothermic interaction. The molecular weight ratios of PI homopolymer/PI segment and PS homopolymer/PS segment are 13.7 and 0.74 respectively, so the difference in the yield stress is due to disentanglement on the PS/PPO and PS/PS sides of the interface. Exothermic interaction is thus shown to be a dominant factor for the disentanglement process of linear homopolymers.

The fractured surface morphology of the ternary blends, as seen by the scanning electron microscopy (SEM) shows that the PS/PI blend morphology changes due to the addition of a diblock copolymer. This change from a spherical shape to an ellipse induces an interfacial tension and reduces the ability to transfer stress across the interface. Conversely, we found that the PPO/PI blend morphology is unaltered by the addition of a diblock coploymer. The blend mechanical properties investigated can be improved indefinitely with diblock copolymer content, at least in the range of compatibilizer concentrations investigated.