CHAPTER VI

CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

In this research, the miscibility of sPS blends was rechecked. The sPS which have two molecular weights, were blended with several polymers such as poly(α-methyl styrene), poly(ethyl methacrylate), poly(n-butyl methacrylate), poly(cyclohexyl methacrylate) and poly(cis-isoprene). Moreover, mechanical properties of their blends were also studied with dynamic mechanical analysis. The conclusion of this research can be summarized as follow:

1. From DSC, the results from two molecular weights of sPS confirm the previous works that the sPS is partially miscible with poly(α-methyl styrene), poly(ethyl methacrylate), poly(n-butyl methacrylate), poly(cyclohexyl methacrylate) and poly(cis-isoprene) and the blended polymers have the glass transition temperature lower than the pure sPS that prepared the samples by melt mixing method.

2. From TGA results of the blended sPS, the sPS blended with poly(cyclohexyl methacrylate) have degraded fastest measured at both 5 % and 10 % weight loss. Moreover, the sPS blends with poly(α-methyl styrene) have degraded slowest at 5 % weight loss and the blends with poly(cis-isoprene) have degraded slowest at 10 % weight loss.

3. The storage modulus (E') of all the blends of both two molecular weight sPS decreased with increasing time and temperature. These result from the chain mobility of sPS blend molecules move easier at higher time and temperature, so that they required low energy to stretch the chain from each other.

4. The storage modulus (E') of all the blends of both two molecular weight of sPS increased with increasing frequency. At high frequency, the loading force was applied with the sPS blends in shorter time period than the low frequency, therefore the storage modulus of the samples at high frequency which resulted from the energy absorbed were lower than at the low frequency.

5. The storage modulus master curves of all the sPS blended systems were created by using Time-Temperature Superposition (TTS) principle. By principle objective, they were created to predict storage modulus behaviors of sPS blended polymers when subjected to the force for a certain time period and were the function of time and frequency (from 0.01-100 Hz). The curves can be plotted as the function of time or frequency for the wide range of the temperature and frequency.

6. Two molecular weights of all sPS blends behaved in same trend. Storage modulus of sPS1 blend system was higher than that of sPS2 blend system. Because sPS1 have higher molecular weight than the sPS2, therefore the chains of sPS1 molecules have longer chains. Consequently, the energy needed to stretch the chained was higher than the sPS2.

7. William Landel Ferry (WLF) constants have been determined from shift factor which used in order to create master curve.

8. All blend systems have tendency to decrease the storage modulus than the pure sPS. The behaviors can be divided in three sections according to the frequency. At higher frequency or in other words, shorter time, the blends of sPS subjected similar to the impact force. At lower frequency or in other words, longer time, the polymer blends of sPS behaved as if they were in between the rubbery platuea. The blended sPSs behaved according to the changes in their glass transition temperatures in intermediate range.

6.2 Recommendations

The recommendations for further research may be given as follows:

1. Other pairs between semicrystalline polymer and amorphous polymer should be chosen for studying in order to found the pronounced mechanical properties of sPS blend polymer.

2. Choose models for predicted WLF constants of polymer blends such as free volume or thermodynamic theory.

3. If we have enough amount of polymer, we should use automatic machine to blend polymer together.

4. It should be interesting to study other mechanical properties of polymer blends such as ultimate mechanical property or other properties such as tensile strength, TMA.