CHAPTER V

CONCLUSIONS AND SUGGESTIONS

5.1 Conclusions

In many applications, the advantages of low cost, ease of fabricating complex parts, and nearly isotropic behavior are good enough to make randomly oriented discontinuous glass fiber being widely used. However, its disadvantage is the limited compatibility of glass fiber and PVC/SAN blend, which can be solved by using silane coupling agent. In this work, the mechanical properties of the composites with various glass fiber contents (10% to 30% by weight) and PVC/SAN compositions (60/40, 70/30 and 80/20) were investigated. The composites were PVC/SAN-treated glass fiber, PVC/SAN-aminosilane treated glass fiber and PVC/SAN-mercaptosilane treated glass fiber. The major finding and conclusions in this work are as follows:

1. For glass fiber PVC/SAN composites, the silane coupling agent concentration affected the interfacial adhesion. To obtain the high tensile strength of the composite, the optimum concentration of aminosilane coupling agent and mercaptosilane coupling agent are 0.5% and 2.0%, respectively.

2. The tensile and flexural properties and hardness of PVC/SAN composites containing glass fiber treated with mercaptosilane coupling agent increased with increasing PVC/SAN composition. The GF-reinforced composite at PVC/SAN ratio of 80:20 provided high tensile strength, flexural strength and hardness. But the HDT decreased because of the reduction of SAN content in the high PVC/SAN composition.

3. The tensile and flexural properties, hardness and HDT of PVC/SAN composites increased with the increasing glass fiber loading. The compatibility of glass fiber and PVC/SAN matrix was enhanced by adding the proper silane coupling agent. It was found that both silane coupling agent increased the glass fiber/mateix adhesion. Mercaptosilane (A-189) performed better as a coupling agent than aminosilane (A-1100).

4. The enhanced interfacial adhesion can possibly be confirmed by the results of fractured surface of SEM. The SEM of the PVC/SAN-treated glass fiber composites showed the good dispersibility and bonding at the interface represented by less glass fiber pulled out from the polymer matrix and less visible gaps were seen.

From this work, the composite, which had the excellent mechanical properties was the PVC 80/SAN 20 composite containing 30% glass fiber treated with mercaptosilane coupling agent (B80/20-G30/M2.0). The properties are as follows:

Tensile strength	88.6	MPa
Tensile modulus	27.2	GPa
Elongation at break	2.6	%
Flexural strength	122.0	MPa
Flexural modulus	7.12	GPa
Hardness (m-scale)	77.7	
HDT (annealed) at 264 psi	81.1	$^{\circ}C$
Density	1.46	g/cm^3

5.2 Suggestions

The use of glass fiber as reinforcement in high volume thermoplastic resins (PVC, PP, PE) should be further studied in the aspects of:

1) Effect of fabrication technique on the distribution of reinforcement in processing, e.g. in an extruder, injection molding.

2) Effect of the characteristic of glass fiber on the properties of the composite, e.g. the aspect ratio of fiber.

3) Effect of the hybrid fiber (glass fiber with other reinforcement such as calcium carbonate, graphite fiber, aramid fiber or natural fiber) on the properties of the composite.