CHAPTER VI

CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusion

The findings obtained in this study can be concluded as the followings:

1. The solvent absorption caused the swelling of PA6. But glass fiber in PA6 provided dimensional stability by restricting the movement of polymer chains, thus reducing the swelling.

2. The glass fiber in PA6/GF composites could improve the heat distortion temperature (HDT) of unsoaked PA6/GF composites because glass fiber could limit the thermal movement of polymer chains and prevent the elastic and plastic deformation.

3. The glass fiber did not affect the glass transition temperature (T_g) of PA6/GF composites. The movement of polymer chains at T_g was from PA6 chains only.

4. The glass fiber could improve the tensile strength, tensile modulus, flexural strength, flexural modulus, compressive strength and Izod impact strength of PA6/GF composites because the good interfacial bonding between PA6 and GF resisted the matrix peeling off from the fiber and stress could transfer over to glass fiber.

5. Orientation of glass fiber in dog bone specimens produced under the condition of this study seemed to be in random position with respect to applied stress (as implied by ROM and IROM models).

6. The chemicals in surrogate gasohol affected both neat PA6 and PA6/GF composites. The thermal and mechanical properties except Izod impact strength of specimens decreased with increasing immersion time or amount of chemicals absorbed. But the effects were reduced in the PA6/GF composites due to lesser mass of PA6 in the PA6/GF composites relative to neat PA6 specimens and because the fiber glass could reduce the movement of polymer chains.

7. Ethanol and aggressive ethanol significantly affected the thermal and mechanical properties of neat PA6 and PA6/GF composites more than isooctane and toluene. This was because water and ethanol in aggressive ethanol are polar chemicals and thus can be absorbed easily by polar amide group in PA6 matrix. On the other

hand, isooctane and toluene are non-polar chemicals; hence, they were not easily absorbed into PA6 matrix.

8. Overall, the effects of gasohol on properties of PA6 were mainly from alcohol component than gasoline component because PA6 could absorb polar materials easier than non-polar materials. Therefore, PA6 and PA6/GF composites should be used with gasohol with low ethanol volume content.

6.2 Recommendations

To further gained insights into the effects of chemicals in gasohol and/or gasohol itself on the thermal and mechanical properties of PA6/GF composites, the following recommendations were suggested:

1. The effects of commercial gasohol on physical, thermal and mechanical properties of PA6/GF composites should be studied for comparison with effects of chemicals in surrogate gasohol used in this experiment.

2. Morphology and orientation of the glass fiber in PA6/GF composites before and after the immersion should be further investigated to gain more understanding on the effects of chemicals in surrogate gasohol and/or actual gasohol on physical, thermal, and mechanical properties of PA6/GF composites.

3. The influence of chemicals of surrogate gasohol at temperature above and below room temperature on the physical, thermal, and mechanical properties of PA6 reinforced with glass fiber should be examined. This experiment should yield better insight into the compatibility of PA6/GF composites with gasohol at real operating conditions of engine.

4. The exact composition of each chemical of surrogate gasohol after being in contact with PA6/GF specimens should be explored by standard tests to determine whether there was any interaction with PA6 or glass fiber. It was also interesting to find out whether any additives in the PA6 matrix could leak out because it might affect the thermal and mechanical properties of PA6/GF composites.