CHAPTER VI

CONCLUSIONS

6.1 Effect of Fiber Content

From the study of the effect of fiber content on the mechanical properties, it can be concluded that the amount of fiber has affected the flexural strength, flexural modulus, impact strength, and compressive strength as the following items: -

- It was observed that the addition of 5-wt % of fiber tended to increase flexural modulus of composite around 20 % to 25 % and increase compressive strength over 10 % compared to that of PMMA without reinforcement. When the fiber content was increased, it tended to increase the flexural modulus at break, and compressive strength.

- For S-fiber composite, it was observed that the impact strength of the Bamboo fiber / PMMA composite without coupling agent at 5-wt % and 20-wt % was higher than that of PMMA without reinforcement around 40 % and 110 %, respectively. When the fiber content was increased, it tends to increase impact strength. However, it did not have significant effect to the impact strength of M-fiber and L-fiber without coupling agent.

- Compared with PMMA without reinforcement, it was noticed that the flexural strength at break at 5-wt % of fiber loading was reduced around 15 % to 30 %. When the fiber content was increased, it tended to decrease the flexural strength at break.

These above results could be due to the properties of fiber, which showed higher impact strength, compressive strength and lower flexural strength than the properties of PMMA.

6.2 Effect of Coupling Agent

From the study of the mechanical properties of the composite when using and not using coupling agent, it can be concluded that

- When using the coupling agent, the impact strength was around 120 % to 160 % higher that of the composite without coupling agent, the compressive strength was around 10 % to 20 %higher than the compressive strength of non-coupling agent composite.

- The flexural modulus at break tended to slightly increase (less than 5 % of difference) when the coupling agent was used.

- Using the coupling agent tended to make the flexural strength at break lower than non-using coupling agent did around 10% for S-fiber. However, it did not have significant effect for L-fiber.

This can be implied that the coupling agent is able to enhance the adhesion between the fiber and PMMA. That makes the mechanical properties of the composite with the coupling agent closer to the mechanical properties of fiber.

6.3 Effect of Aspect Ratio

After treating the S-fiber with NaOH, the aspect ratio of the fiber increases. The mechanical properties were studied related to the aspect ratio. It can be concluded that

- The increase of aspect ratio led to increase in physical properties. The composite with 126.5-aspect-ratio fiber had 20 % higher flexural modulus, 15 % higher flexural strength at break, 40 % higher impact strength, and 10 % higher compressive strength than that with 79.7-aspect-ratio fiber.

From the study, bamboo Fiber has potential to enhance the crucial physical properties such as impact strength and flexural modulus (especially impact strength when coupling agent is used). However, the flexural strength is dropped when the fiber is occupied. This problem can be solved by increase the aspect ratio of the fiber.

Suggestions for Further Work

There are many works needed to be done in order to make more understanding on bamboo/PMMA composite as followed.

- Adding another reinforcing material to improve the flexural strength and color appearance of the composite.
- Treating the fiber with NaOH and then adding with coupling agent to know about the effect of coupling after lignin is removed.
- Take environmental stress cracking test for *in vitro* study of mechanical properties of the composite.