

MANUFACTURE OF BAMBOO THERMOPLASTIC COMPOSITE USING POLYETHYLENE AS MATRIX

by

AZWIN BINTI ALIAS

Under the supervision of

Dr. Jamaludin Kasim

Submitted in partial fulfillment of the requirements for
The Bachelor of Science (Hons.) in Applied Chemistry

Faculty of Applied Science
Universiti Teknologi MARA

April 2000

ABSTRACT

This thesis is to study on the Malaysian bamboo, in scientific name, *Gigantochloa scortechinii*, which is to determine the effect of mechanical and water absorption properties and its suitability as a new material for manufacture of bamboo thermoplastics composite as a new product. The effectiveness of a MAPP as a coupling agent in bamboo flour/polyethylene composite has been evaluated. The composite panels were made with 10 to 50% bamboo flour, with the MAPP being incorporated in the panels at a level of 0 to 4% MAPP. As the addition of MAPP is increase, the MOR values also increase except for the MOE and WA value which is inversely proportional due to MOR value. The effectiveness of MAPP is believed to be the result of efficient incorporation at the bamboo/polyethylene interface, thus providing effective coupling of the polar bamboo component to the polymer matrix.

ACKNOWLEDGEMENT

BISMILLAHIRRAHMANIRRAHMANIRRAHIM.....

First of all, I would like to express my deepest gratitude and thanks to ALLAH S.W.T., because of giving me an opportunity to complete my thesis successfully.

A special thanks goes to my supervisor, Dr. Jamaludin Kasim for his guidance, help, patience and knowledge throughout my thesis. My thanks also goes to Pn. Zarila Mohd Shariff, the BSAC course tutor and Prof. Madya Dr. Lee Pat Moi, thesis coordinator, for their help, assistance and understanding.

To En. Ismail Ramli, En. Mustapa Baba, and all the people who had given me their help, guide and assistance, thank you very much.

Lastly, I wish to thank to all my friends and colleagues for their moral support and help during my thesis.

Thank You Very Much.

TABLE OF CONTENT

| | Page |
|---|------|
| ABSTRACT | i |
| ACKNOWLEDGMENT | ii |
| TABLE OF CONTENTS | iii |
| LIST OF FIGURES | vi |
| LIST OF TABLES | vii |
| LIST OF ABBREVIATIONS | viii |
| CHAPTER | |
| 1.0 INTRODUCTION | 1 |
| 2.0 LITERATURE REVIEW | 4 |
| 2.1 Bamboo | 4 |
| 2.1.1 Why Choose Bamboo | 6 |
| 2.1.2 Genus Gigantochola | 6 |
| 2.1.3 General Characteristic & Properties of Bamboo | 7 |
| 2.1.4 Uses of Bamboo | 8 |
| 2.2 Thermoplastic Composite | 9 |
| 2.2.1 Properties of Polyethylene | 10 |
| 2.2.2 Advantages & Applications of Polyethylene | 12 |
| 2.2.3 Effect of Bamboo Flour & Plastic Ratio | 12 |
| 2.2.4 Effect of MAPP | 13 |
| 2.3 Method | 14 |
| 2.3.1 Injection Moulding | 14 |
| 2.3.2 Compressing | 14 |

| | |
|--|----|
| 2.3.3 Extrusion | 15 |
| 3.0 MATERIAL AND METHOD | 16 |
| 3.1 Materials | 16 |
| 3.2 Methods | 17 |
| 3.2.1 Preparation of Bamboo Flour | 17 |
| 3.2.2 Compounding Process | 17 |
| 3.2.3 Manufacture of Particle Board | 19 |
| 3.3 Board Evaluation | 20 |
| 3.4 Conditioning | 20 |
| 3.4.1 Bending Properties | 20 |
| 3.4.2 Water Absorption Properties | 20 |
| 3.5 Testing | 21 |
| 3.5.1 Bending (Modulus of rupture) | 21 |
| 3.5.2 Water Absorption | 22 |
| 4.0 RESULT AND DISCUSSION | 23 |
| 4.1 Physical Properties | 23 |
| 4.2 Mechanical and Water Absorption Properties | 23 |
| 4.3 Bending Properties of <i>G. scortechinii</i> | 25 |
| 4.3.1 Effect of MAPP on MOR Value | 25 |
| 4.3.2 Effect of Bamboo Flour & Plastics Ratio on MOR Value | 27 |
| 4.4 Young Modulus Properties of <i>G. scortechinii</i> | 27 |
| 4.4.1 Effect of MAPP on MOE Value | 27 |
| 4.4.2 Effect of Bamboo Flour & Plastics Ratio on MOE Value | 29 |
| 4.5 Water Absorption Properties of <i>G. scortechinii</i> | 29 |
| 4.5.1 Effect of MAPP on WA Value | 29 |