

UNIVERSITI TEKNOLOGI MARA

**CHICKEN EGGSHELL EFFECT AS BIO-FILLER
ON MECHANICAL STRENGTH AND THERMAL
PERFORMANCE OF EPOXY COMPOSITE**

RASSIMI BIN ABDUL GHANI

Thesis submitted in fulfilment of the requirements

for the degree of

Master of Science

Faculty of Applied Sciences

June 2011

Author's Declaration

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the result of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any other degree or qualification.

In the event that my thesis be found to violate the conditions mentioned above, I voluntarily waive the right of conferment of my degree and agree to be subjected to the disciplinary rules and regulations of Universiti Teknologi MARA.

Name of Candidate	<u>RASSIMI BIN ABDUL GWANI</u>
Candidate's ID No.	<u>2008412436</u>
Programme	<u>MASTER OF SCIENCE (RESEARCH)</u>
Faculty	<u>FACULTY OF APPLIED SCIENCES</u>
Thesis Title	<u>CHICKEN EGG SHELL EFFECT AS BIO-FILLER ON MECHANICAL STRENGTH AND THERMAL PERFORMANCE OF EPOXY COMPOSITE</u>
Signature of Candidate	
Date	<u>02/07/2011</u>

ABSTRACT

The performance of the chicken eggshells as filler in epoxy composites was studied. Different sizes with various proportions of the eggshells samples were tested and comparisons were made. The tensile strength and flexural strength were found to be decreased at more than 50% as the eggshells loading applied in the composite sample at 50% by weight percentage. However, the impact strength was found to be increased as the eggshells loading increased which indicated that the eggshells had imparted some rigidity and stiffness to the composite samples. Meanwhile in thermal conductivity test where the conductivity of the samples declined as the eggshell loading increased. In other word, the thermal insulation of the composite increased with the eggshell loading. From the result of water absorption test, the absorptivity was found to be slightly increased as the eggshells loading increased where the absorption percentage of the water was about 3% for all composite samples.

ACKNOWLEDGEMENTS

Alhamdulillah. Upon completion of this project, I would like to express my gratitude to many parties. My heartfelt goes to my supervisor, Assoc. Prof. Dr. Mohd Hanafiah Bin Abidin. I really would like to thank him for his trust and had been very understanding. My big thank you goes to Mr. Ahmad Zafir Bin Romli for his big helps and guidance which really help in my project completion. For all of the lectures and laboratory assistances, I do appreciate all of your helps. Not to forget to my lovely wife, my family, Mr. Mohd Hariz and all of my friends, thank you for your support and encouragement that I will never be able to forget.

Rassimi Bin Abdul Ghani

TABLE OF CONTENTS

	Page
TITLE PAGE	
AUTHOR'S DECLARATION	ii
ABSTRACT	iii
ACKNOWLEDGEMENT	iv
TABLE OF CONTENTS	v
LIST OF TABLES	viii
LIST OF FIGURES	ix
LIST OF ABBREVIATIONS	xi
CHAPTER 1: INTRODUCTION	
1.1 Composite Materials	1
1.2 Reason of Chicken Eggshells Usage	2
1.3 Scope of Study	3
1.4 Significance of Study	4
1.4 Objectives of the Study	5
CHAPTER 2: LITERATURE REVIEW	
2.1 Thermosettings	6
2.2 Epoxy	9
2.3 Chicken Eggshell	15
2.4 Mechanical Performance Study	19
2.5 Thermal Performance Study	23
2.6 Other Related Studies	28
2.6.1 Eggshell Strength and Its Keratin Sulfate	28
2.6.2 Eggshell as Natural Absorbent	29
2.6.3 Adsorption of Cd(II) and Cu(II) from aqueous solution by carbonate hydroxylapatite derived from eggshell waste	29
2.6.4 Effect of Eggshell Powder on the Stabilizing Potential of Lime on an Expansive Clay Soil	31
2.6.5 Influence of Eggshell Matrix Proteins on the Precipitation of Calcium Carbonate	32
CHAPTER 3: METHODOLOGY	
3.1 Materials	35
3.2 Method	36
3.2.1 Sample Preparation	36