

**DYNAMIC MODULUS THERMAL ANALYSIS ON POLYMER COMPOSITE
(HIGH DENSITY POLYETHYLENE WITH NATURAL RUBBER)**

SHARADINA BINTI EMBONG

**Final Year Project Report Submitted in Partial Fulfilment
of the Requirements for the Degree of
Bachelor of Sciences (Hons.) Physics
in the Faculty of Applied Sciences
Universiti Teknologi MARA**

MAY 2007

ACKNOWLEDGEMENT

First and foremost, I am thankful to Allah the Almighty for compassionate, merciful, and blessing. I want to thank my supervisor, Dr Syed Yusainee Syed Yahya, for his guidance, involvement, support, advice and encouragement throughout the preparation of this thesis. I also want to thank Assoc. Prof. Dr Mohd Hanafiah Abidin, my co – supervisor, for all his help in finishing this thesis.

I also want to appreciate for the insightful help, encouragement, and understanding given by my beloved friends, Wan Isma Safiah bt. Wan Ismail, Fadiatul Hasinah bt. Mohamad, Nur Iryani bt. Ahmad Badri, Arziana bt. Mohamad Azaman, Ahmad Syazwan, Shazulia Sapongi, Nor Asmiza bt Tahir, and all friends that contribute their helps and advice. I want to give my thanks also to the lab assistants for their helps in preparation of my sample. Not forgetting, the most of all, my family, especially my mother, A'idlah bt. Md Isa, and my father, Embong b. Abdul Ghani, for their understanding, concern, care and their attribution for me. Without this people, I will not be in Universiti Teknologi Mara, finishing my study and thesis. I dedicated this thesis to all of you.

Finally, with the completion of this thesis, I hope it will give a lot of benefits to those who reads and study this thesis, and it will also help give some knowledge to those who are involves in the field of physics, rubber, plastic technology and polymer.

TABLE OF CONTENT

AKNOWLEDGEMENTS	ii
TABLE OF CONTENTS	iii
LIST OF TABLES	vi
LIST OF FIGURES	vii
LIST OF ABBREVIATIONS	ix
ABSTRACT	xi
ABSTRAK	xii
INTRODUCTION	1
1.2 Problem Statement	5
1.3 Important And Validity	5
1.4 Justification	5
1.5 Significance of Study	5
Objectives	6
LITERATURE REVIEW	7
2.1 Polymer	7
2.1.1 Thermoplastics	8
2.1.2 Thermosets	9
2.1.3 Elastomers	10

ABSTRACT

DYNAMIC MODULUS THERMAL ANALYSIS ON POLYMER COMPOSITE (HIGH DENSITY POLYETHYLENE WITH NATURAL RUBBER)

The dynamic modulus thermal analysis on polymer composite (high density polyethylene (HDPE) with natural rubber (NR)) was ascertained. The composites containing 100% HDPE, 90% HDPE 10% NR, 80% HDPE 20% NR were produced by blending them together and pressing them into a mold shape. The testing using Perkin Elmer DMA – 7 is to get the data of mechanical properties of composition such as storage modulus, E' , loss modulus, E'' and damping factor, $\tan \delta$ and plot them as a function of temperature, Celsius ($^{\circ}\text{C}$). The range of temperature used is about -150°C to 150°C and using the fixed frequency 1Hz. Many equipments and techniques can be used to find the mechanical properties of composite. However, DMTA technique can do it at wide range temperature compared to others such as DSC technique. From the graph of loss modulus and damping factor, the glass transition temperature, T_g can be obtained. The glass transition temperature is a key factor in deciding the usefulness of a polymer. The composites added with NR have higher damping ability that leads to poor molecular bonding. To get the better results, the compatibalizer can be used when adding HDPE with NR.

CHAPTER 1

INTRODUCTION

Polymer is a term used to describe molecules consists of structural units and a large number of repeating units connected by covalent chemical bonds. It was derived from the Greek words *polys* meaning *many*, and *meros* meaning *parts*. Polymers are classified according to four main groups that is, thermoplastics, thermosets, elastomers and coordination polymers. Thermoplastic known as a material that is deformable. It melts when heated and freeze to a brittle glassy state when cooled. Thermosets were characterized by a high degree of cross-linking and resist deformation. When it is formed, it cannot be reshaped by heating. Rubber is one of the most important of all elastomers. Natural rubber is polymer that repeating unit is called isoprene. In 1823, Charles Goodyear succeeded in vulcanizing natural rubber by heating it with sulfur. In this process, sulfur chain fragments attack the polymer chains and lead to cross-linking. Most of the rubber used in the United State today is a synthetic variety called styrenebutadiene rubber (SBR). This rubber also called BUNA-S.