

**RELATIONSHIP BETWEEN CROSSLINK DENSITY AND PHYSICAL
PROPERTIES OF FILLED NATURAL RUBBER VULCANIZATE**

NORHASIMAH BT ABDUL HANAN

**BACHELOR OF SCIENCE (Hons.)
APPLIED CHEMISTRY
FACULTY OF APPLIED SCIENCES
UNIVERSITI TEKNOLOGI MARA**

NOVEMBER 2008

This Final Year Project Report entitled **“Relationship Between Crosslink Density And Physical Properties Of Filled Natural Rubber Vulcanizate”** was submitted by Norhasimah Bt Abdul Hanan, in partial fulfillment of the requirements for Degree of Bachelor of Science (Hons.) Applied Chemistry, in the Faculty of Applied Sciences, and was approved by



Mr. Mohd Som B Said
Supervisor

B. Sc. (Hons.) Applied Chemistry
Faculty of Applied Sciences
University Technology MARA
40450 Shah Alam
Selangor



Miss Sabrina Bt M. Yahya
Project Coordinator

B. Sc. (Hons.) Applied Chemistry
Faculty of Applied Sciences
University Technology MARA
40450 Shah Alam
Selangor

Dr Yusairee B Mohamad
Head Programme
B. Sc. (Hons) Applied Chemistry
Faculty of Applied Sciences
University Technology MARA
40450 Shah Alam
Selangor

Date: 16/12/2008

ACKNOWLEDGEMENTS

First and foremost I to thank to Almighty God for giving me the inner strength and good heath through completing this project paper. My heartfelt thanks goes to my supervisor Mr Mohd Som B Said for his time, patience and encouragement and professional guidance to completing this study. Finally, I wish to express my deepest appreciation to those who have contributed in some way to carry out this project successfully.

TABLE OF CONTENTS

	Page
ACKNOWLEDGEMENTS	iii
TABLE OF CONTENTS	iv-v
LIST OF TABLE	vi
LIST OF FIGURE	vii
LIST OF ABBEVIATIONS	viii
ABSTRACT	ix
ABSTRAK	x
 CHAPTER 1 INTRODUCTION	 1
1.1 Background of study	2
1.2 Significant of study	2
1.3 Objective of study	
 CHAPTER 2 LITERATURE REVIEW	
2.1 Natural rubber	3
2.1.1 History of natural rubber	3
2.1.2 Standard Malaysian Rubber	3
2.2 Vulcanization	3
2.2.1 Introduction	3-4
2.2.2 Vulcanization behavior of natural rubber	4
2.3 Component of formulation	5
2.3.1 Vulcanization agent	5
2.3.2 Activator	5
2.3.3 Accelerator	6
2.3.4 Antioxidant	6
2.3.5 Fillers	7
 CHAPTER 3 METHODOLOGY	
3.1 Introduction	8
3.2 weighing	8
3.3 Mixing the compounding ingredient and rubber	8-9
3.4 Testing	10
3.4.1 Introduction	10
3.4.2 Rheological testing	10
3.4.2.1 Mooney viscosity	10-12
3.4.2.2 Cure time	13-14

ABSTRACT

RELATIONSHIP BETWEEN CROSSLINK DENSITY AND PHYSICAL PROPERTIES OF FILLED NATURAL RUBBER VULCANIZATE

This study is to find out which vulcanization system offer better vulcanizate properties with short vulcanization time. Relationship between crosslink density and physical properties of conventional vulcanizate system, efficient vulcanizate system, semi-efficient vulcanizate system of SMR 10 rubber were determined. In this study rubber and other filler was masticated using two-roll mill machine at 70°C. Two-roll mill machine 18" in diameter with speed ratio 1:5:1 was used to sheet the compound and for incorporation of the vulcanizing ingredients. Tensile test, hardness test and density were determining relationship between crosslink density and physical properties of difference vulcanizate system. The swelling test was used to determine the crosslink density of vulcanizate system. In this study were found that conventional vulcanizate system give high value in crosslink density and corresponding to increased their physical properties such as tensile stress and density but increased their cure time.