

**IMPROVEMENT OF THE STUDY ON POLARIZATION  
CURRENT OF FILLER ADDED NATURAL RUBBER**

This thesis is presented in partial fulfillment for the award of the Bachelor of Electrical  
Engineering (Hons.)

**UNIVERSITI TEKNOLOGI MARA**



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## ABSTRACT

The paper describes the polarization current characteristics of filler added natural rubber. There are many parameters that can be employed for predicting the insulation properties and the charging and discharging is one of them. One of the ways to observe the charging and discharging activities is by measuring the polarization and depolarization currents.

In this study, samples of natural rubber filled with varying amount of fillers were moulded and measurement will be focused on their polarization current, which is through their charging processes. The measurement of the samples is conducted by the use of Keithley 6517A Electrometer, which is interfaced to and controlled by a personal computer via a computer program using the TestPoint™ Software. The samples are placed on a specially designed test jig. The polarization current process is set for 5 minutes (300 sec) with 500 V DC injected between the terminals of the test jig.

Fillers of three types namely, French Chalk, China Clay and Carbon Black, were added in varying amount to the natural rubber. Natural rubber with French Clay, China Clay and Carbon Black used as a sample because the cost are cheaper, easy to get locally and compatible in production as a samples. For all the samples, certain chemicals have to be added to ensure proper vulcanisation and long lasting, and they are Zinc Oxide, Stearic Acid, Ozone Wax, Colour (Green), Sulphur, MBTS and Nonox CNS, which act as additives, ozone wax, colour, vulcanizes agent, accelerator, and antioxidant agent, respectively.

For the case of French Chalks and China Clay, it is found that filler amount of 30 phr or less proved to improve the insulating properties of natural rubber. This is evident from the magnitudes of the polarization current. For the case of Carbon Black as filler, it is found that any amount of more that 10 phr increases the material's conductivity and this is also evident from the polarization current magnitudes.

## TABLE OF CONTENTS

	<b>PAGE</b>
<b>TITLE</b>	i
<b>DEDICATION</b>	ii
<b>DECLARATION</b>	iii
<b>ACKNOWLEDGEMENT</b>	iv
<b>ABSTRACT</b>	v
<b>TABLE OF CONTENTS</b>	vi
<b>LIST OF FIGURES</b>	ix
<b>LIST OF TABLES</b>	xii
<b>LIST OF ABBREVIATIONS</b>	xiii
<b>CHAPTER 1            INTRODUCTION</b>	
1.0     Introduction	1
1.1     Objective	2
1.2     Problem Statement	2
1.3     Scope of work	3
1.4     Organization of thesis	4
<b>CHAPTER 2            LITERATURE REVIEW</b>	
2.0     Introduction	5
2.1     Natural Rubber	5
2.2     Types of Natural Rubber	8
2.3     Vulcanizing process	9
2.4     Reason for vulcanizing	9
2.5     Pigments	9
2.6     Filler	10

# CHAPTER 1

## INTRODUCTION

### 1.0 Introduction

Electrical insulation is a material or object that contains no free electric charge to permit the flow of electric current. When a voltage is placed across an insulator, no charge or current flows. An object intended to support or separate electrical conductors without passing current through itself is called an insulator [1].

Natural Rubber (NR) makes a considerably good electrical insulation. A much larger class of materials, for example rubber-like polymers and most plastics are still “good enough” to insulate electric wiring and cables even though they may have lower bulk resistivity. These materials can serve as practical and safe insulating materials for low to moderate voltages (hundreds, or even thousands, of volts). The electrical insulation is a material or object that resists the flow of electric current. When voltage placed across an insulator will produce very little current flows. An object intended to support or separate electrical conductors without passing current through itself is called an insulator. An insulator is a material with atoms that have tightly bonded valence electrons and resist the flow of electrical current [2].

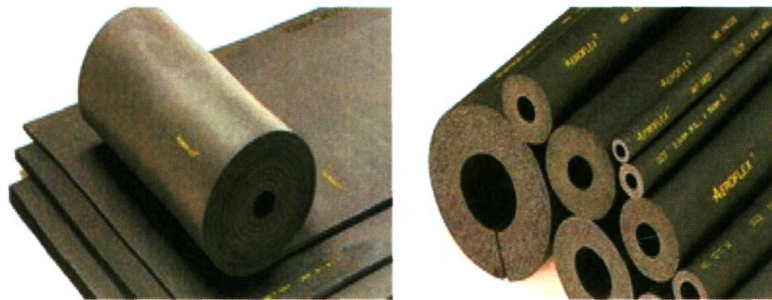


Figure 1.1: Natural Rubber as an insulator