

**OPTIMIZATION TENSILE PROPERTIES OF SODIUM
BICARBONATE/NATURAL RUBBER COMPOSITE**

NUR FATNIN AYUNIE BINTI ABDULL RAHIM

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

AUGUST 2023

**OPTIMIZATION TENSILE PROPERTIES OF SODIUM
BICARBONATE/NATURAL RUBBER COMPOSITE**

NUR FATNIN AYUNIE BT ABDULL RAHIM

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

AUGUST 2023

This Final Year Project Report entitled “Optimization of Tensile Properties of Sodium Bicarbonate/Natural Rubber” was submitted by Nur Fatnin Ayunie binti Abdull Rahim in partial fulfilment of the requirements for the Degree of Bachelor of Science (Hons.) Applied Chemistry, in the Faculty of Applied Sciences, and was approved by

Assoc. Prof . Dr. Razif bin Mohammed Nordin
Supervisor
B.Sc.(Hons.) Applied Chemistry
Faculty of Applied Chemistry
Universiti Teknologi Mara
02600 Arau
Perlis

Ts Lokman Hakim B. Ibrahim
Co supervisor
Universiti Malaysia Perlis
(UniMAP) Kampus Pauh
Perlis

Dr. Siti Nurlia Ali
Program Coordinator
Faculty of Applied Sciences
Universiti Teknologi MARA
02600 Arau
Perlis

Dr Nur Nasulhah Kasim
Head Centre of Studies
Faculty of Applied Sciences
Universiti Teknologi MARA
02600 Arau
Perlis

Date: 4th AUGUST 2023

ABSTRACT

OPTIMIZATION OF TENSILE PROPERTIES OF SODIUM BICARBONATE/NATURAL RUBBER COMPOSITE

The main aim of this study was to analyze the effect of sodium bicarbonate on tensile properties and morphological of natural rubber (NR) compounds in the curing time range of 1, 3, 5, and 10 minutes. The NR was mixed with fixed amount of sodium bicarbonate (SB) which is 2.5 phr by using the two-roll mill. The NR composite was vulcanised at different curing times which is 1, 3, 5, and 10 minutes at constant temperature 150 °C in the oven. The mechanical properties of the NR composite were investigated in term of tensile properties according to ASTM D412 by using Universal Testing Machine (INSTRON). The result indicates that tensile strength, elongation at break of the NR composite increase at 3 minutes of curing time and decrease at further curing time. LCD Digital Microscope (CELESTRON) was used to evaluate the morphology of the NR composite to determine the porosity produced from the decomposition of sodium bicarbonate. The observation indicates that the pore size increases as the curing time increases.

TABLE OF CONTENT

	Page
ABSTRACT	iii
ABSTRAK	iv
ACKNOWLEDGEMENTS	v
TABLE OF CONTENTS	vi
LIST OF TABLES	viii
LIST OF FIGURES	ix
LIST OF ABBREVIATIONS	x
CHAPTER 1 INTRODUCTION	
1.1 Background of study	1
1.2 Problem statement	4
1.3 Significance of study	5
1.4 Objective of study	6
CHAPTER 2 LITERATURE REVIEW	
2.1 Rubber	7
2.1.1 Natural rubber	7
2.1.2 Synthetic rubber	9
2.1.3 Natural rubber vs synthetic rubber	11
2.2 Blowing agent	12
2.2.1 Chemical blowing agent	12
2.2.2 Physical blowing agent	13
2.2.3 Sodium bicarbonate as blowing agent	14
2.3 Vulcanization	15
2.4 Cross-Linking	16
2.5 Tensile Properties of NR	17
CHAPTER 3 METHODOLOGY	
3.0 Introduction	19
3.1 Chemical	19
3.2 Instrumentation	20
3.2.1 Two-Roll Mill Machine	20
3.2.2 Oven	21
3.2.3 Universal Testing Machine (INSTRON)	22
3.2.4 LCD Digital Microscope (CELESTRON)	23