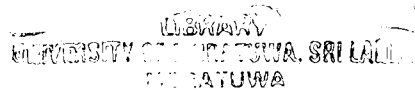


STUDY OF PHYSICAL AND CHEMICAL PROPERTIES OF CHLORINATED LATEX FILMS

By

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This thesis was submitted to the Department of Chemical and Process
Engineering of the University of Moratuwa in partial fulfillment
Of the requirements for the degree of
Master of Science in
Polymer Technology.

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Department of Chemical and Process Engineering
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DECLARATION

I hereby declare that this submission is my own work and that to the best of my knowledge and behalf, it contains no material previously published or written by another person nor material which to substantial extent, has been accepted for the award of any other academic qualification of a university or other institute of higher learning except where an acknowledgement is made in the text.

M.D.S.A.Amarasiri

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ABSTRACT

There has been a wide speculation of the protein allergy in powdered gloves. It has caused some countries to replace the natural rubber latex with synthetic lattices. The experiments have shown that chlorination is a good answer to the protein allergy problem in the production of powderless gloves. The level of chlorination varies from one manufacturer to another. There aren't enough research to prove the optimum chlorination level with regard to different physical properties. This research was done to fill this void. The research was focused on finding tensile strength and friction coefficients at various chlorination levels. Further analysis was done on surface topology and extractable protein content for selected samples.

The films were prepared from prevulcanised natural rubber latex. The chlorination was done by using a solution of sodium hypochlorite with 1% m/m hydrochloric acid. The dried prevulcanised latex films were chlorinated at different concentrations with different immersion times. Tensile strength was checked for all the films by using Hounsfield H10KT Electronic tensile testing machine. Friction coefficient was found for all the films according to the ASTM standard. The surface topology was observed for selected samples from transmitted light of the OPTIPHOT-POL microscope. Finally extractable protein content was found from BCA enhanced protocol method for selected samples.

The results showed that there is a cyclic pattern for the variation of tensile strength and friction coefficient with the time of chlorination. The chlorine concentration of 1150 ppm was selected as a suitable concentration which showed better results. The chlorination time of 12 minutes was selected as a suitable time which gave better results. The surface topology of these selected samples revealed that the removal of excessive compounding ingredients, surface hardenings and surface cracks increase with the level of chlorination. These factors have an effect on the films. The surface cracks can cause leakage of the film. The extractable protein content reduces with the increase of chlorination level. However it is necessary to do an analysis from Fourier transform Infra-red (FTIR) spectrometer on the formation of different bonds during the chlorination reaction. Since the facilities were not available it was not possible to

perform the FTIR test.

The overall results showed that chlorine concentration of 1150 ppm at 12 minutes is the optimum chlorination level. However an efficient leaching system has to be performed to further reduce the extractable protein content of the films. The chlorination system can be further improved by using the chlorine gas system instead of the acidified Sodium Hypochlorite solution.



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TABLE OF CONTENTS

	Page No:
Declaration	i
Abstract	ii
Acknowledgment	iv
Table of contents	v
List of Tables	viii
List of Figures	ix
List of Symbols	xi
CHAPTER 1 – INTRODUCTION	1
1.1 Background	2
1.2 Aims and objectives	6
CHAPTER 2 – LITERATURE REVIEW	7
2.1 Natural rubber latex	8
2.1.1 Historical background	8
2.1.2 Chemical composition	8
2.1.3 Structure of latex particle	10
2.1.4 NR latex preservatives	12
2.1.5 Concentrated latex	12
2.2 NR latex compounding ingredients	13
2.3 Latex products	13
2.3.1 Latex dipped products	14
2.4 Dipping methods	14
2.5 NR latex glove industry	15
2.5.1 Supported gloves	15
2.5.2 Unsupported gloves	15
2.6 Synthetic latex glove industry	16
2.7 Problems with NR latex dipped products	18
2.8 Powder as a lubricant	19

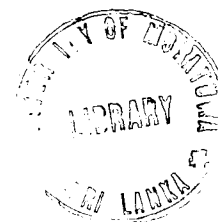
2.8.1	Problems associated with powder	19
2.9	Latex allergy	21
2.9.1	Historical background	21
2.9.2	Chemical background	22
2.9.3	Medical background	24
2.9.4	Impact on glove market	26
2.10	Solution for latex protein problem	27
2.10.1	Powder free treatment	27
2.10.2	Protein reduction method	29
2.11	Chlorination	33
2.11.1	History of chlorination	33
2.11.2	Chlorination system	33
2.11.3	Other factors for chlorination	38
2.11.4	Advantages of chlorination	38
2.11.5	Disadvantages of chlorination	39
2.11.6	Effect of chlorination on properties	39
 CHAPTER 3 – METHODOLOGY		40
3.1	Specification test	41
3.2	Prevulcanised latex film	42
3.2.1	Compound formulation	42
3.2.2	Prevulcanisation of latex	43
3.2.3	Preparation of films	43
3.3	Chlorination of latex film	44
3.4	Measuring of tensile strength	45
3.5	Measuring of surface friction	46
3.6	Analysis of surface topology	46
3.7	Determination of protein content	47
 CHAPTER 4 – RESULTS & DISCUSSION		50
4.1	Results	51
4.2	Effect on tensile strength	51
4.3	Effect on surface topology	57
4.4	Effect on friction coefficient	66



4.5 Effect on extractable protein content	72
CHAPTER 5 – CONCLUSION	78
5.1 Final conclusion	79
5.2 Future recommendations	79
ANNEXURES	81
REERENCES	82



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List of Tables

Page No:

Table 2.1	-	Helium permeabilities of glove materials	17
Table 2.2	-	Comparison of glove materials used in the chemical glove market	17
Table 2.3	-	Comparison of glove materials used in the general purpose glove market	17
Table 2.4	-	Comparison of glove materials used in the product protection glove market	18
Table 2.5	-	Comparison of glove materials used in the medical exam glove market	18
Table 2.6	-	Properties of some NR latex proteins	24
Table 3.1	-	Prevulcanised latex formulation	42
Table 4.1	-	Tensile strength under different levels of chlorination	51
Table 4.2	-	Friction coefficient under different levels of chlorination	66
Table 4.3	-	Extractable protein content at 1150 ppm chlorine concentration	73
Table 4.4	-	Extractable protein content at 12 minutes chlorination time	75

List of Figures

Page No:

Figure 2.1	-	Cross section of latex particle	10
Figure 4.1	-	Variation of tensile strength on chlorination time for the samples immersed in different chlorine concentrations	53
Figure 4.2	-	Photograph of the surface of NR sample obtained from the optical microscope with 25 magnification	57
Figure 4.3	-	Photograph of the surface of CR-11-04 sample obtained from the optical microscope with 25 magnification	58
Figure 4.4	-	Photograph of the surface of CR-11-08 sample obtained from the optical microscope with 25 magnification	58
Figure 4.5	-	Photograph of the surface of CR-11-12 sample obtained from the optical microscope with 25 magnification	59/63
Figure 4.6	-	Photograph of the surface of CR-11-16 sample obtained from the optical microscope with 25 magnification	59
Figure 4.7	-	Photograph of the surface of CR-11-20 sample obtained from the optical microscope with 25 magnification	60
Figure 4.8	-	Photograph of the surface of CR-11-24 sample obtained from the optical microscope with 25 magnification	60
Figure 4.9	-	Photograph of the surface of CR-10-12 sample obtained from the optical microscope with 25 magnification	62

Figure 4.10	-	Photograph of the surface of CR-13-12 sample obtained from the optical microscope with 25 magnification	63
Figure 4.11	-	Photograph of the surface of CR-14-12 sample obtained from the optical microscope with 25 magnification	64
Figure 4.12	-	Photograph of the surface of CR-15-12 sample obtained from the optical microscope with 25 magnification	64
Figure 4.13	-	Variation of friction coefficient on chlorination time for the samples immersed in different chlorine concentrations	67
Figure 4.14	-	Graph of extractable protein content Vs chlorination time	74
Figure 4.15	-	Graph of extractable protein content Vs chlorine concentration	76



List of Symbols

AIDS	Acquired Immune Deficiency Syndrome
BCA	Bi Cinconic Acid
DRC	Dry Rubber Context
FDA	Food and Drugs Association
FTIR	Fourier Transmission Infra Red
HMW	High Molecular Weight
IgE	Immunoglobulin E
IRRDB	International Rubber Research Development Bureau
KD	Kilo Daltons
LA-TZ	Low Ammoniated concentrated Latex with Tetra Methyl Thiurum Disulphide /Zinc Oxide
LMW	Low Molecular Weight
MPa	Mega Pascal
NR	Natural Rubber
ppm	parts per million
PV	PreVulcanised
PVA	Poly Vinyl Alcohol
PVC	Poly Vinyl Chloride
RRI	Rubber Research Institute
RVNRL	Radiation Vulcanised Natural Rubber Latex
SDS-PAGE	Sodium Dodecyl Sulphate Poly Acrylamide Gel Electrophoresis
TSC	Total Solid Content
WSP	Water Soluble Polymer
ZDEC	Zinc Di Ethyl Dithio Carbamate