

Analysis of Aqueous Extractable Protein in Radiation Pre vulcanized Natural Rubber Latex (RVNRL) And Sulphur Pre vulcanized Natural Rubber Latex (SVNRL)

Sofian Bin Ibrahim, Mohd Noor Wadi Bin Mat Lazim, Syuhada Bt Ramli, Chai Chee Keong, Khairul Hisyam Bin Mohd Yusof, Muhammad Saiful Bin Omar, Najib Bin Mohd Zakey, Hafizuddin Bin Maseri and Noor Hasni Bt M. Ali

RAYMINTEX Plant
Malaysian Nuclear Agency
Bangi, 43000 Kajang, Selangor, Malaysia.
E-Mail: sofian_ibrahim@nuclearmalaysia.gov.my

Abstrak

Penggunaan sinaran tidak hanya menghasilkan Radiation Pre vulcanized Natural Rubber Latex (RVNRL) yang boleh digunakan untuk penghasilan produk yang bebas nitrosamines, malahan RVNRL juga dapat menyingkirkan alahan Jenis IV yang disebabkan oleh kandungan protein yang tinggi dalam sesuatu produk. Air rendaman ketika penghasilan sarung jari dari RVNRL dan Sulphur Pre vulcanized Natural rubber Latex (SVNRL) telah diambil. Kandungan protein daripada sampel air diukur mengikut protokol ujian ASTM D5712-2010. Air rendaman dari proses penghasilan sarung jari berasaskan RVNRL menunjukkan kandungan protein yang jauh lebih tinggi daripada SVNRL. Ini menjelaskan mengapa produk berasaskan RVNRL mengandungi kandungan protein yang sangat rendah dan dengan itu mengurangkan risiko alahan Jenis IV.

Abstract

The use of radiation do not only produces Radiation Pre vulcanized Natural Rubber Latex (RVNRL) that can be used for the production of nitrosamines free products, moreover, RVNRL also able to exclude type IV allergy that caused by high protein content in the products. Leaching water from production of finger coat from RVNRL and Sulphur Pre vulcanized Natural rubber Latex (SVNRL) has been collected. Extractable protein content from water samples measured according to the test protocol ASTM D5712-2010. Water from leaching process of finger coat made from RVNRL showed a higher protein content than SVNRL. This explains why RVNRL based products contain very low protein content and thus reduce the risk of Type IV allergy.

Keywords: RAYMINTEX, RVNRL, protein, type IV allergy

INTRODUCTION

Radiation Vulcanization is an alternative technology to the conventional crosslinking process by using sulphur plus its other chemicals ingredients. The use of radiation do not only produces Radiation Pre vulcanized Natural Rubber Latex (RVNRL) that can be used for the production of nitrosamines free products, moreover, RVNRL also able to exclude

type IV allergy that caused by high protein content in the products i.e glove, finger coat, ballon, condom etc [1,2].

Type IV allergy, also known as allergic, involves a delayed skin rash that is similar to poison ivy with blistering and oozing of the skin. Latex allergy generally develops after repeated exposure to products containing natural rubber latex. When latex-containing medical devices or supplies come in contact with mucous membranes, the membranes may absorb latex proteins. The immune system of some susceptible individuals produces antibodies (by IgE-antibodies) that react immunologically with these antigenic proteins [3].

Symptoms can include:

- Contact urticaria - either localized to the area in contact with the latex, or sometimes more widespread.
- Rhinosinusitis and conjunctivitis.
- Asthma.
- Anaphylaxis - rarely

During irradiation of latex, gamma ray will cut down long protein chain in the latex to shorter protein chain. These shorter protein chains will be easy to wash out during leaching process (soak with 70 -100 °C water at minimum 1 minute period) at production line. Hence, tests were carried out to compare protein content in leaching water between RVNRL and Sulphur Pre vulcanized Natural rubber Latex (SVNRL).

EXPERIMENTAL

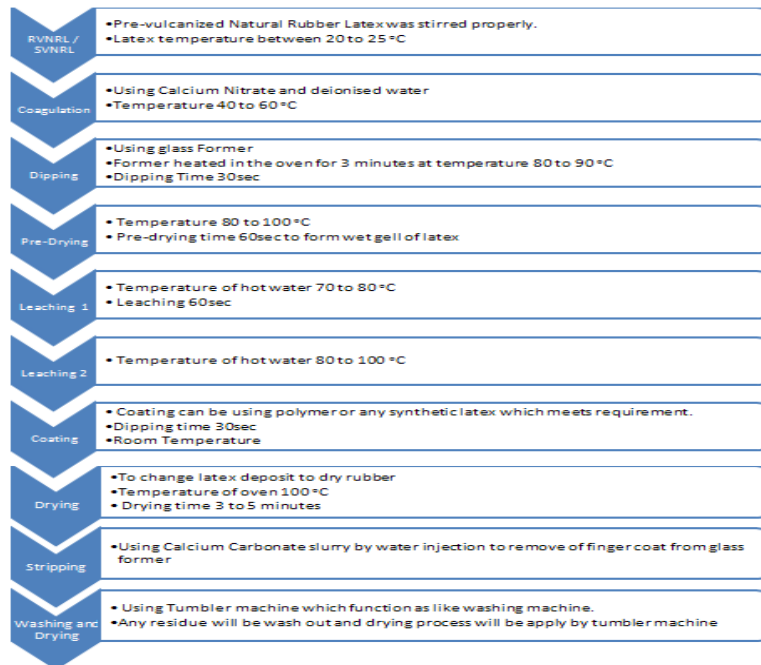
Materials

- i. Sulphur prevulcanized natural rubber latex (SVNRL) supplied by Microclean Tech Rubber (M) Sdn. Bhd.
- ii. Radiation prevulcanized natural rubber latex (RVNRL) type RII [4].

Production of Finger Coat and Water Sampling

Finger coat from both latex were produced at Microclean Tech Rubber (M) Sdn. Bhd., Lot 5, Jalan Sultan Mohamad 5, Bandar Sultan Sulaiman, Port Klang, 42000, Pelabuhan Klang, Selangor.

The productions of finger coat from RVNRL and SVNRL are done according to the method as given in Scheme 1.



Scheme 1: Productions method of finger coat from RVNRL and SVNRL

Extractable Protein Content

Leaching water from production of finger coat from RVNRL and SVNRL has been collected. Water samples then send to Global Testing & Consultancy for Rubber at the following address: Rubber Research Institute of Malaysia, 47000 Sungai Buloh, Selangor, Malaysia. Extractable protein content measurement were done according to the test protocol ASTM D5712-2010; Standard Test Method for Analysis of Aqueous Extractable Protein in Natural Rubber and Its Products Using the Modified Lowry Method.

RESULTS AND DISCUSSIONS

The results of the assessments done on RVNRL and SVNRL are summarized in Table 1.

Table 1: The Summary of the Results of Assessments Done on RVNRL and SVNRL

No	Sample	Protein Content, µg/ml
1	SVNRL- 1 st Dipping tank	13
2	SVNRL- 2 nd Dipping tank	25
3	RVNRL- 1 st Dipping tank	67
4	RVNRL- 2 nd Dipping tank	111

From Table 1, it showed that protein content in the 1st and 2nd dipping tank for RVNRL based finger coat indicate the presence of a protein that is significantly higher than SVNRL.

This supports earlier theories that state that long protein chains in the latex will be cut down into shorter chains during the irradiation process [1]. These shorter protein chains will be easy to wash out during leaching process with hot water.

CONCLUSION

Water from leaching process of finger coat made from RVNRL showed a higher protein content than SVNRL. This explains why RVNRL based products contain very low protein content and thus reduce the risk of Type IV allergy.

ACKNOWLEDGEMENTS

Sincere words of thanks to other members of RAYMINTEX Plant and Microclean Tech Rubber (M) Sdn. Bhd. for their cooperative effort in making this project a success.

REFERENCES

1. K. Makuuchi, Ph.d (2003), *An introduction to Irradiation Vulcanization of Natural Rubber Latex*, T.R.I Global Co Ltd
2. Wan Manshol W. Z., (1998) Semi Industrial Scale RVNRL Preparation, Products Manufacturing And Properties, Radiat. Phys. Chem Vol. 52, 611- 616
3. <http://latexallergyresources.org/>, American Latex Allergy Association, Retrieved 2014-12-31

4. Wan Manshol bin W. Zin, Norjanah bte. Mohid, Jusoh bin Hassan and Ma'zam bin Md. Said, (1993). Preparation, Properties and Processability of RVNRL Using Malaysian-Produced Latices. A Paper Presented at the National Executive Management Seminar on Radiation Vulcanisation of Natural Rubber Latex, 22 February 1993, Bangi, Malaysia.
5. Ma'zam M. S. (2005), Prevulcanized Latices, Course On Latex Concentrate Production, Prevulcanized & Other Modified Latices, Malaysia, 10
6. Wan Manshol W. Zin, (1992). Radiation Processing of Natural Rubber. A Paper Presented at Kongres dan Seminar Sains dan Teknologi, Kuala Lumpur, Malaysia.
7. Wan Manshol bin W. Zin, (1995). Radiation Vulcanisation Natural Rubber Latex and Its Properties. A Paper Presented at the International Conference on Frontiers of Polymers and Advanced Materials, 16-20 January 1995, Kuala Lumpur, Malaysia.