

Urea- a potential preservative for Natural Rubber Latex.

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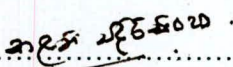
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DECLARATION

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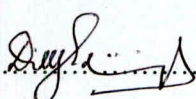
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DEDICATION

Dedicated to the name of
My late loving "Māli"
Mr. Nalaka Edirisinghe,

Wishing him every courage and opportunity
To attend Nibbhana
Soon in his journey!

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ABBREVIATIONS

NR	Natural Rubber
RRISL	Rubber Research Institute of Sri Lanka
LA	Low Ammonia
HA	High ammonia
DAHP	Di ammonium hydrogen phosphate
ZDC	Zinc diethyl dithiocarbamate
ZnO	Zinc Oxide
TMTD	Tetramethylthiuram disulphide
DRC	Dry Rubber Content
TSC	Total solids content
VFA	Volatile Fatty Acid
SPP	Sodium pentachlorophenate
NDMA	N- Nitrosodimethylamine
NDEA	N-Nitrosodiethylamine
NDiPA	N-Nitrosodiisopropylamine
NDPA	N-Nitrosodipropylamine
NDBA	N-Nitrosodibutylamine
NPIP	N-Nitrosopiperidine
NPYR	N-Nitrosopyrrolidine
NMOR	N-Nirosomorpholine
NEPhA	N-Nitroso N-ethyl N-phenylamine
NMPhA	N-Nitroso N-methyl N-phenylamine
NDBzA	N-Nitrosodibenzylamine
NDiNA	N-Nitrosodiisononylamine

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ABSTRACT

Low ammonia centrifuged natural rubber (NR) latex is generally preserved with the secondary preservative, tetramethylthiuram disulphide and zinc oxide (TMTD/ZnO). This conventional system has been found to be carcinogenic due to the nitrosamines generated by TMTD during its application. Hence the main objective of the study was to evaluate the suitability of readily available, low cost urea for manufacture of low ammonia centrifuged NR latex used in cast products.

Field latex was treated with the conventional TMTD/ZnO system and varying quantities of the amino chemical as well. The latex samples were centrifuged to obtain the latex concentrate. The latex concentrates thus produced were stored for 15, 45 and 60 days and the most important NR latex characteristics such as alkalinity, dry rubber content, total solids content, volatile fatty acid number, KOH number and mechanical stability time were evaluated and compared with those of the Control. In addition to the latex characteristics, Gas Chromatography / Mass Spectrometric Analysis were carried out to detect nitrosamines. Further, the physico-mechanical properties and resistant to thermal degradation (aging) properties were evaluated using cast films. Further, the standard test for total extractable proteins was carried out in order to identify the protein denaturing ability of the amino chemical. Moreover, the standard test for microbial examination was done in order to identify the preservation ability of the amino chemical used.

Analyzing the latex characteristics during the overall storage period, it was found to be that most of the properties like pH, VFA number, alkalinity and MST are in accordance with the ISO specifications. The analysis of physical properties suggests a slight decrease of some phenomena (like tear strength) than that of control, but still above margin for cast product manufacturing. Aging studies suggest that the urea treated samples show even better resistance to thermal degradation than that of control.

The urea treated samples also show a reduction in total extractable protein content, thus seems much useful in latex based product manufacturing. Moreover, the microbiological examination suggests a good preservative ability of the novel preservative. When the Gas Chromatographic analysis was carried out in selective ion monitoring (SIM) mode, peaks

accountable for NDBA (N-Nitrosodibutylamine) was identified only in TMTD/ZnO system. This was absent in any of the urea treated films.

Analyzing the overall performance of each concentration, it can be suggested that urea is a potential substitute for TMTD/ZnO preservative system, which is expected to be free from nitrosamines generation. The 0.021% urea treated latex sample shows the best properties even better to the control.