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QUALITY IMPROVEMENT OF RADIATION VULCANISED NATURAL RUBBER LATEX

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An attempt was made to improve the green strength of fresh natural rubber latex by exposure to low doses of γ radiation followed by centrifuging to reduce the non-rubber ingredients. The centrifuged latex was then vulcanised by exposure to γ-radiation in presence of n-butyl acrylate as sensitizer. The non-rubber ingredients were further removed by suitable leaching operations. As a result of the chemical changes accompanied by exposure of latex to γ-radiation, the extractable protein content of the radiation vulcanised natural rubber latex (RVNRL) films decreased to acceptable levels (below 50 µg g^{-1}). The mechanical properties of RVNRL also improved by using centrifuged natural rubber latex having high gel content or by blending with sulphur vulcanised natural rubber latex (SVNRL).

Keywords: Leachable protein, Prevulcanisation, Radiation vulcanisation, Shrinkage

INTRODUCTION

Natural rubber latex can be vulcanised by exposure to γ-rays from a Co^{60} source to obtain radiation vulcanised natural rubber latex (RVNRL). This latex can be used for the production of rubber based products in the way similar to that adopted for sulphur pre-vulcanised latex. Radiation vulcanized natural rubber latex (RVNRL) possesses several advantages over the sulphur vulcanized, such as the absence of nitrosamine compounds, better transparency, very low cytotoxicity and less rubber proteins that cause allergic response (Keong *et al.*, 2009; Varghese *et al.*, 2000; Makuchi, 2003). The main drawback of RVNRL is the lower modulus and comparatively lower tensile strength. Some of the factors that control the efficiency of vulcanisation of NR latex by γ-irradiation are initial molecular weight of rubber, green strength and the amount of non-rubber ingredients present. An increase in green strength contributes to higher tensile strength of RVNRL films. Generally latex concentrate is stored for about three weeks to achieve an improvement in molecular weight and hence green strength. Both colloidal stability and green strength of rubber in latex concentrate increase during storage. This is due to the formation of fatty acid soaps and microgel. Ammonium soaps formed due to

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