

CHLORINATION OF LIQUID NATURAL RUBBER

B. Veeralakshmanan, N. Radhakrishnan Nair, N.M. Mathew and A.L. Sasimohan

Veeralakshmanan, B., Nair, N.R., Mathew, N.M. and Sasimohan, A.L. (1995). Chlorination of liquid natural rubber. *Indian Journal of Natural Rubber Research*, 8(2) : 85-90.

Natural rubber (NR) on chlorination turns into a white thermoplastic material which is widely used by the paint and lacquer industries taking advantage of its improved ageing properties, flame retardance, adhesion to various substrates etc. A major impediment in the manufacture of chlorinated natural rubber is the gel content of raw NR which makes preparation of solution difficult. In this study this problem has been solved to a great extent by using depolymerised liquid natural rubber (LNR). Substantially higher amounts (upto 20%) of LNR could be dissolved in carbontetrachloride to obtain a liquid mass that could be stirred and homogenized during the course of chlorination. This has resulted in manifold increase in the output compared to conventional method of chlorination of NR solution. Properties of the product have been found comparable with chlorinated rubber prepared from raw NR.

Key words : Natural rubber, Depolymerisation, Chlorination, Liquid natural rubber.

N. Radhakrishnan Nair, N.M.Mathew (for correspondence) , Rubber Research Institute of India, Kottayam - 686 009, Kerala, India ; B. Veeralakshmanan and A.L. Sasimohan, Grindwell Norton Ltd., R&D Centre, Bangalore, India.

INTRODUCTION

The process of chlorination of NR has been a subject of extensive investigation ever since it was first attempted in 1930s. Chlorination of NR in solution form was reported by Bloomfield (1944) and that in latex stage by Van Amerongen (1952). Latex stage chlorination has problems due to various side reactions encountered in the aqueous medium. Starting from dry rubber, preparation of chlorinated rubber by treating NR in solution with gaseous chlorine has been reported by Ramakrishnan *et al.* (1953). The solvent used was carbontetrachloride. Dissolution of NR in the solvent is a major problem because of its limited solubility, more time for dissolution, high viscosity of the resultant solution, gel content etc. Use of low molecular weight guayule rubber (Mn 75,000) as a feed stock

for preparation of coatings grade chlorinated rubber has been reported by Thames and Kaleem (1990). This was intended for economic utilization of the low molecular weight fraction of guayule rubber. Use of a 5 per cent solution was reported in this case. Solutions containing even 5 per cent of NR are extremely difficult to stir and so homogeneity is affected when NR solutions of higher concentrations are used for the reaction. Therefore, lower concentrations are being used, resulting in lower output per batch. Premastication is another requirement when NR solutions are to be prepared for which a mixing mill is needed. The possible advantages of using LNR are the ease of preparation of the solution of a higher concentration, more efficient stirring during chlorination and higher output per batch from a given reactor.