

PRODUCTION OF LIQUID NATURAL RUBBER BY THERMAL DEPOLYMERIZATION

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Depolymerization of natural rubber, using a combination of mechanical and thermal energies aided by a peptiser, has been attempted. Peptiser dosage, temperature and heating time for producing liquid natural rubber (LNR) of desired viscosity were optimised. LNR can be produced by thermal depolymerization, with or without the addition of a peptiser. Possibility to produce LNR of desired viscosity by appropriately fixing the peptiser dosage, temperature and duration of heating was revealed. As degradation was found rapid at higher temperatures depolymerization at lower temperature is desirable. Properties of the liquid rubber such as Brookfield viscosity, intrinsic viscosity, iodine value and acetone extract have been determined. IR and NMR studies were also carried out. Vulcanization of LNR with sulphur resulted in very poor strength properties.

Key words:- Liquid natural rubber, Depolymerization, Peptiser, Intrinsic viscosity, Brookfield viscosity.

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INTRODUCTION

Liquid natural rubber (LNR) is a modified form of natural rubber (NR) prepared by size reduction of molecular chains of the naturally occurring polymer. This can be achieved by the application of mechanical energy, chemicals, heat or high energy radiation, alone or in combination. Depolymerization can be carried out in latex stage or in dry rubber stage. Commercial production of LNR in USA was carried out by depolymerizing solid NR (Hardman and Lang, 1950), while a pilot plant for the production of LNR in latex stage, using phenyl hydrazine/air redox system, was reported to be set up in Ivory Coast (Allet-Don and Lemoine, 1986).

Several studies have been reported on the depolymerization of natural rubber. Ac-

cording to Mayo *et al.* (1968a), cobalt compounds are active metal catalysts for oxidation of rubber. Metal stearates are also reported to catalyse thermal oxidation of NR (Phan Van Ninh *et al.*, 1987). The pro-oxidant effects of hydrazines and sulphur compounds have been described by Mayo *et al.* (1968b). Preparation of liquid rubber by depolymerization of NR in solution in the presence of phenylhydrazine-FeCl₂-O is reported by Mori and Fujii (1976). Pautrat and Marteau (1975) used 4 methyl benzene sulphinic acid and hydrogen peroxide to prepare oligomers of low molecular weight. The use of solar energy for preparation of LNR has also been reported (Lillekeratne *et al.*, 1977). Photochemical degradation of NR solution in the presence of H₂O₂ resulted in hydroxyl terminated LNR (Ravindran *et al.*, 1988). Depolymerization of NR using