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HIGH TEMPERATURE VULCANIZATION OF NATURAL RUBBER BY SULPHUR DONORS AND TRIACCELERATOR SYSTEM

C. K. Das, M. S. Banerjee and W. Mills

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High temperature vulcanization of natural rubber using sulphur donors and sulphur accelerated with triaccelarator systems was studied with the help of a rheometer. Thiocarbonyl type of accelerator acts as booster for both MBTS and TMTD, with more pronounced effect on TMTD, through a sulphurating complex at stoichiometric ratio. Sulphurration by MBT, DPG and TMTD together, can be varied depending on their molar ratios and there appears to be an interaction between DPG and TMTD.

Key words : Natural rubber, Vulcanization, High temperature, Sulphur donors, Triaccelerator system.

C. K. Das (for correspondence), Materials Science Centre, Indian Institute of Technology, Kharagpur - 721 302, India; M. S. Banerjee and W. Mills, Indian Rubber Manufacturers' Research Association, Thane - 400 604, Maharashtra, India.

INTRODUCTION

Vulcanizing systems giving stable network structure are very much desirable for high temperature vulcanization. One way to achieve this is to use sulphur donors (Coran, 1978). Another is efficient use of sulphur by suitable choice of accelerator systems (Bateman, 1963, Das, *et al.*, 1977). In order to use those systems a knowledge of vulcanization mechanism and optimum level of curatives etc. are of prime importance. In the present work the mechanism of vulcanization has been studied with the help of continuous cure measurement in a rheometer. The systems used were mercaptobenzothiazoledisulphide (MBTS), tetramethylthiuramdisulphide (TMTD), N-oxydiethylenethiocarbonyl N'-oxydiethylene sulphenamide (Curite-18), mercaptobenzothiazole (MBT) and diphenylguanidine (DPG). Based on the observations, a mechanistic scheme has been suggested in each case.

EXPERIMENTAL

Natural rubber (NR) was masticated and mixed with other ingredients in a two roll open mixing mill (325 x 150 mm). Master-batch technique was adopted for compounding. After mixing, the stock was stored for a minimum period of 16 h and then was used for the study on cure characteristics of the compounds at 170-180°C using a rheometer.

The compounded stocks were cured to optimum cure (as obtained from the rheometer). Physical properties were then determined on the cured sheet after allowing the cured sheet to equilibrate at ambient temperature for 24 h. The formulations are given in Tables 1 to 5.

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