

EVALUATION OF TBBS AND TBzTD BASED BINARY ACCELERATOR SYSTEMS IN NATURAL RUBBER COMPOUNDS

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Nitrosamines are receiving special attention within the rubber industry because they are mutagenic and carcinogenic. Conventional accelerators such as tetramethyl thiuram disulphide (TMTD) and N - oxydiethylene-2- benzothiazole sulphenamide (MBS) are carcinogenic because of the production of nitrosamines (NA) during heating. A safe thiuram accelerator, tetrabenzyl thiuram disulphide (TBzTD) in combination with a safe sulphenamide accelerator (N-tert-butyl 2-benzothiazole sulphenamide (TBBS) has been used in an efficient vulcanisation (EV) system for natural rubber. The vulcanisates containing TBzTD and TBBS show similar mechanical properties and better scorch safety compared to TMTD and MBS.

Keywords: Accelerator, Natural rubber, Nitrosamine, Scorch, Vulcanisation

INTRODUCTION

Vulcanisation or curing is an essential step in the manufacture of rubber products (Roberts, 1988). This is achieved when the compounded rubber is heated to an appropriate temperature. The first commercial method of crosslinking has been attributed to Charles Goodyear in 1839 (Datta, 2002) thereby mechanical properties of natural rubber could be improved by heating after mixing with sulphur. Three special types of sulphur vulcanisation systems such as efficient vulcanisation (EV), semi-efficient vulcanisation (SEV) and conventional vulcanisation (CV) systems have been developed over the years. Efficient vulcanisation (EV) systems are those where a low level of sulphur (0.3- 0.8 phr)

and a correspondingly high level of accelerator (6.0-2.0 phr) are used for achieving an extremely high heat and reversion resistance in the rubber vulcanisates (Roberts, 1988; Datta, 2002; Morton, 1995). In CV systems, the sulphur dosage is high (2-3.5 phr) and the accelerator level is low (1.0-0.4 phr). The CV systems provides better flex and dynamic properties but poor thermal and reversion resistance. For getting mechanical, dynamic and thermal properties intermediate between that of CV and EV systems, semi EV (SEV) systems with dosage of accelerator (2.5-1.0 phr) and sulphur (1.0 - 1.8 phr) are employed (Roberts, 1988; Datta, 2002). In the vulcanisation reaction of elastomers, accelerators perform