Performance of lower grades of natural rubber in tyre tread compounds

by

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The work described in this thesis was carried out by me at the Rubber Research Institute of Sri Lanka, under the supervision of Dr. W.M.G. Seneviratne and a report on this has not been submitted to any university for another degree.

29/10/2009 .....

Date

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Signature

I certify that the above statement made by the candidate is true and that this thesis is suitable for submission to the university for the purpose of evaluation.

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This thesis is dedicated to my

dearest parents

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Abstract

This project focuses on matching cure characteristics and physical properties of different compounds, prepared using different rubber grades such as RSS1, RSS4, TSR 20 and lower grades of processed NR, synthetic rubber SBR, BR and their blends with NR using commercial tyre tread compounds. For this, a typical commercial tyre tread compounding formula presently used by a tyre manufacturing industry was chosen. Preparation of compounds was carried out using the same industrial procedure.

In the first stage of the investigation, the curative system included TBBS (1p.p.h.r.), TMTD (0.2p.p.h.r.), Sulphur (1p.p.h.r.).Since reversion was observed in rheographs in this system, the curatives were subsequently changed. Compounding and curing was carried out without TMTD and the curing system included only TBBS (1.25p.p.h.r.) and Sulphur (1.75p.p.h.r.).

The second stage results were analyzed and results reported in this thesis are based on the evaluation of physical properties of cured compounds and the cost evaluation. A detailed description on rubber grades available in Sri Lanka, production process of the tread compounds and the physical properties tested also included in this thesis.

List of abbreviations

6PPD	N-1, 3-dimethylbutyl-N-phenyl-p-phenylenediamine
BR	Polybutadiene Rubber
Bt-	Benzothiazol-2-yl
CBS	N-Cyclohexylbenzothiazole-2-phenamide
DIN	Deutsches Institute fur Normung (West German test Organization)
dNm	DeciNewton meteres
EPDM	Ethylene propylenediene Rubers
EV	Efficient Vulcanization
IIR	Butyl Rubeer
IR	Isoprene Rubber (Synthetic)
IRSG	International rubber study group
MBS	N-Morpholylbenzothiazole-2-sulphenamide
MBT	2-Mercaptobenzothiazole (benzothiazoline-2-thione)
MBTS	Dibenzothiazylle disulphide
NBR	Actrylonitrile butadiene rubber
NR	Natural Rubber
OEM	Original equipment manufactures
phr	Parts perhundred of rubber
PRI	Plasticity Retention Index
RSS	Ribbed Smoked sheets
S	Sulpher

SBR	Styrene Butadiene Rubber
SG	Specific gravity
SMR	Standard Malasian rubber
TBBS	N-butylbenzothiazole-2-sulphenamide
TMQ	Polymerized1-2-dihydro-2,2,4-trimethylquinoline (AGERITE RESIN D)
TMTD	Tetramethylthiuram disulphide (METHYL TUADS)
TMTD	Tetramethylthiuram disulphide
ts	Softening temperature
ts_2	Scorch time
TSR	Technically Specified Rubber
ZMBT	Zinc salt of mercaptobenzothiazole(ZETAX)

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