STUDY OF THE EFFECT OF DIFFERENT CARBON BLACK COMBINATIONS ON PHYSICO-MECHANICAL PROPERTIES OF NATURAL RUBBER BASED SOLID TYRE TREAD COMPOUND

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DECLARATION OF THE CANDIDATE & SUPERVISOR

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The above candidate has carried out research for the master's dissertation under my supervision

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ABSTRACT

The performance and the life-time of a solid tyre depend on the properties of the solid tyre tread compound. Abrasion resistance and rebound resilience are the key parameters of the solid tyre tread compound. Carbon black types used in tread compounds and carbon black ratio in the combined filler are the main contributors for the above two properties. But these two properties behave in contradictory ways such that when carbon black particle size is small, the abrasion resistance is high when rebound resilience is low. Hence most suitable carbon black type and ratio should be selected into solid tyre tread compound to have the optimum abrasion resistance and rebound resilience. In this research, the effect of N220 and N330 carbon black grades and their ratio on solid tyre tread compound was studied. N220: N330 ratio was varied in the combined filler from 0:50 pphr to 50:0 pphr to find the optimum ratio, which provides the best abrasion resistance in solid tyre tread compound. N220:N330 optimum ratio was observed as 30:20 at observed maximum tensile properties and abrasion volume loss was at its lowest point. Further, the highest standard deviation of carbon black aggregate size was observed for this ratio and that ratio has shown the highest reinforcement in the solid tyre tread compound.

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LIST OF ABBREVIATIONS

Abbreviation	Description
6PPD	N-(1,3-Dimethylbutyl)-N'-phenyl-p-phenylenediamine
ASTM	American Society for Testing and Materials
CTP	N-(cyclohexyl-thio)phthalimide
et al	and others
MDR	Moving Die Rheometer
M_H	Maximum Torque
M_L	Minimum Torque
NR	Natural Rubber
pphr	parts per hundred parts of rubber
PVI	Pre vulcanization inhibitor
rpm	Revolutions per minute
SG	Specific Gravity
SIR	Standard Indonesia Rubber
SMR	Standard Malaysia Rubber
STR	Standard Thai Rubber
t_{90}	Optimum Cure Time
TBBS	N-tert-butyl-2-benzothiazole sulphenamide
TMQ	Polymerized 2,2,4-trimethyl-1,2-dihydroquinoline
t_{s2}	Induction Time
TSR	Technically Specified Rubber
300% modulus	Modulus at 300% elongation