

**EFFECT OF SHORT FIBERS ON HIGH LOAD
BEARING PRESS-ON TIRE TREAD COMPOUND**

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Abstract

This research work was carried out to investigate the effect of short nylon fiber on natural rubber based solid tire tread compound. It was also an objective of this work to find the best fiber loading that would produce short fiber-rubber composites of good physical and mechanical properties of vulcanized rubber. A screening procedure was carried out to identify the best fiber content.

Natural Rubber based compound was used and Nylon 6 short fibers were used. Length of fiber was selected as around 5 mm and fiber loadings were varied from 1 to 20 part per hundred rubber. The short fibers were taken from the RFL dip nylon cords but an additional dry bonding system was added to the compound to overcome the bonding failures in cutting edges of the fibers.

The Physico-mechanical properties, Dynamic properties and Cure characteristics were studied in detail. There is a positive influence on the tearing strength, cut & chip resistance and compression test (load bearing capability) with the increase in fiber content. The tensile strength and elongation properties were negatively influenced with the loading of short fiber. There was no major influence on Hardness and Specific Gravity of the composites with the increase of fiber content. At the low fiber loading, Abrasion resistance, rolling resistance and hysteretic energy loss (Resilience) of composites had positive influence on properties but beyond the fiber content of 3 parts per hundred rubbers, the properties were negatively influenced.

The Minimum torque and Mooney viscosity decreased with the fiber loading up to 5 phr but it increased with the further loading of short fiber. The scorch time increased with the fiber loading but there was no major influence on optimum curing time (t_{90})

As such the general conclusion inferred from this study favor a high potential of using short nylon fiber as reinforcing material for tire tread compounds which are used in high load bearing applications in solid tires.

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LIST OF ABBREVIATIONS

Abbreviation	Description
ASTM	American Society for Testing and Materials
BR	Butadiene Rubber
BS	British Standard
CR	Chloroprene Rubber
CTV	N - [Cyclohexylthio] Phtalimide
DIN	“Deutsches Institut für Normung” which means 'German Institute of Standardization
DMA	Dynamic Mechanical Analyzer
EPDM	Ethylene propylene diene monomer
E'	Storage modulus
E''	Loss modulus
HMT	Hexamethylene tetramine
HRH Tetramine	Hydrated Silica, Resorcinol and Hexamethylene Tetramine
IRHD	International Rubber Hardness
LEFM	Linear elastic fracture mechanism
MH	Maximum torques
ML	Minimum torques
NBR	Acrylonitrile Butadiene Rubber
NR	Natural Rubber
phr	Part per Hundred Rubber
PAC	Polycyclic aromatic compound
PON	Press-On Tires
PVI	Pre Vulcanization Inhibitor

Abbreviation	Description
RFL	Resorcinol Formaldehyde Latex
RSS	Rib smoke sheet
SBR	Styrene Butadiene Rubber
SFRP	Short fiber reinforced polymer
ts2	Scorch time
t90	Optimum cure time
TBBS	N-Tert-Butyl-2-Benzothiazolesulfenamide
TMQ (Polymerized)	2,2 4-Trimethyl - 1,2 Dihydro Quinoline-