

**EFFECT OF LIGNIN BASE ANTIOXIDANT ON NATURAL
RUBBER BASE SOLID TYRE TREAD COMPOUND**

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DECLARATION

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ABSTRACT

The purpose of this research was to study the feasibility of lignin as an antioxidant for tire tread compounds. Lignin is naturally abundant and cost competitive wood derivatives possessing antioxidant properties and offering reactive functional groups on their surfaces. Further, lignin is a natural, non-hazardous and sufficiently bio degradable material.

The present study deals with a natural rubber based tire tread compound containing different antioxidant combinations.

Lignin as a bio polymer was combined with commercially available antioxidants (6PPD and SKF) to investigate from the view point of their thermo-oxidative aging. The research specifically focused on producing tire tread compound for industrial applications.

Physico-mechanical properties such as tensile properties tear strength, hardness, abrasion and flexing, and cure characteristics, on tire tread compound was investigated before and after thermo-oxidative aging. The results obtained are shown that the lignin exerts a stabilizing effect. Moreover lignin blends with the selected antioxidants increased the stabilization effect.

The conclusion extracted from this study demonstrates that the higher potential of using lignin as a natural antioxidant substitute for commercial tire tread compounds.

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ABBREVIATIONS

ASTM	American Society for Testing and Materials
HDPE	High Density Poly Ethylene
KL	Kraft Lignin
NR	Natural Rubber
6PPD	N(1,3-dimethyl-butyl)-N'-phenyl-P-phenylenediamine
SKF	2, 2-Dicyclopentylene-bis-(4-methyl -6-tert -butyl – Phenolis
PAH	Polycyclic Aromatic Hydrocarbon
MI	Mooney Initial
MF	Mooney Final
ML	Minimum Torque
MH	Maximum Torque
t_{s2}	Scorch Time
t_{90}	Optimum Cure Time
Cu	Copper
Ni	Nickle
Mn	Manganese
UV	Ultra Violet Radiation
MOR	2 (Morpholinothio) benzothiazole
PVI	Pre-Vulcanization Inhibitor
RSS	Rib Smoked Sheet.
Tg	Glass Transition Temperature

Td	Decomposition Temperature
FTIR	Fourier Transform Infrared Spectroscopy
NMR	Nuclear Magnetic Resonance
TG	Thermogravimetry
DTA	Differential Thermal Analysis
DSC	Differential Scanning Calorimetry
SG	Specific Gravity
AO	Antioxidant