

**DEVELOPMENT OF A SOLID TIRE BLACK TREAD
COMPOUND WITH EXTREMELY LOW POLYCYCLIC
AROMATIC HYDROCARBON CONTENT**

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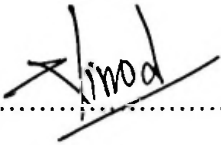
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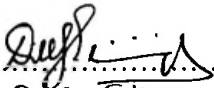


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ABSTRACT

The Polycyclic Aromatic Hydrocarbons (PAHs) can be identified as a large group of organic compounds. These organic compounds have two or more fused aromatic rings that contain only carbon and hydrogen atoms. These PAHs are non-polar compounds, lipophilic and insoluble in water.

Drinking water can be contaminated with PAHs and PAHs can be available mainly in coal and tar deposits. PAHs are hazardous and the extent to which it is hazardous depends on concentration of PAHs, time duration of exposure to PAHs and the type of PAHs. All PAHs are not hazardous to human health. Human exposure has various methods such as smoking rates, fuel types in cooking, pollution control on power plants, industrial processes and moving vehicles. Two methods are readily available in vehicle, which is emission of incomplete combustion of fuel and worn off parts in tires.

Tread compound in tires is a source of PAHs due to the presence of some raw materials used in compounding such as processing oil and carbon black. Tire tread part contains up to 28% of extender oil to provide the required elasticity and stickiness. High aromatic (HA) oil content in car tires is in the range of 6% to 8% of the total tire mass and between 11% to 16% of the tread. These HA oils have a PAH content between 300-700 mg kg⁻¹ and tire has an estimated PAH content in the range of 13.5 mg-112 mg kg⁻¹. Default (tread) compound of industry was selected for this project and a rubber compound was developed with an extremely low PAH level by using alternative raw materials such as PAH free carbon black, glove reclaim (white), vegetable oil derivatives and coconut shell powder. The number of PAHs in the compound reduced to 13.48 mg kg⁻¹ from 51.6 mg kg⁻¹.

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LIST OF ABBREVIATIONS

DNA - Deoxyribonucleic acid

ML - Moment Lowest

MH - Moment Highest

PAHs - Polycyclic Aromatic Hydrocarbons

LFGB – Test for food feed code

EC – European Commission

HA – High Aromatics

ZnO – Zinc Oxide

TRC – Tire Rubber Crumb

SBR – Styrene-Butadiene Rubber

ISO – International Organization of Standardization

REACH – Registration, Evaluation, Authorization & Restriction of Chemicals

PPHR – Parts Per Hundred Rubber

DPG - N,N'-Diphenyl Guanidine

TMTM - Tetramethylthiuram Monosulfide

TBBS – N-Tert-Butyl-2-Benzothiazyl Sulfenamide

CBD - Carbon Black Dispersion

t_{c90} - 90% Cure Time

t_{s2} - Scorch Time

6PPD - N-(1, 3-Dimethylbutyl)-N' - Phenyl-P-Phenylenediamine.