

## Predicting the performance of S-SBR / BR based Tire Tread Compounds

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### ABSTRACT:

The outermost layer of a tire, the tread, commonly consists of a blend of two or more elastomers for an optimum performance. Several performance requirements such as durability, fuel efficiency, driving safety, driving comfort, cornering, and aquaplaning need to be met by the tread. The three most important tread performance indicators Of these are durability, which is related to Abrasion Resistance (AR), fuel efficiency, which is related to Rolling Resistance (RR), and driving safety, which is related to Wet Skid Resistance (WSR).. Binary S-SBR (solution styrene-butadiene copolymer) / BR (polybutadiene) blends are used in state-of-the-art tire treads due to the advantageous set of low AR, low RR and better WSR.

In this work, weight ratios 100 / 0 to 60 / 40 of blends of S-SBR and BR extended with two types of oils: a mineral-based Treated Aromatic Distillate Extract (TDAE) and a bio-based type called Vivamax 5000 are evaluated for the best AR, RR and WSR. The effect of the blend ratio and the type of the oil on these performance indicators is considered. Conventional methods including DIN-Abrader for AR,  $\tan \delta$  at 60 °C / Payne effect ( $\Delta G$ ) for RR, and  $\tan \delta$  at 0 °C for WSR are used for the evaluation. Additionally, an alternative indicator for predicting WSR is presented with a high frequency testing approach using Broadband Dielectric Spectroscopy (BDS). A discussion of the molecular aspects of the best AR, RR and WSR for the respective combinations of blend ratio(s) and the oil(s) is included in the final evaluation.