

# PROCESSING OF MODERN PASSENGER CAR TIRE TREADS

In cooperation with Trinseo

Modern passenger car tire treads should fulfil the requirements of the tire tread labelling: low rolling resistance, outstanding wet traction and low noise. Rolling resistance and wet traction can mainly be influenced by the chosen tire tread compound. During the last years, the use of modified polymers in tire tread compounds become more and more popular. The introduction of modified polymers in tire tread compounds leads indeed to an improvement in rolling resistance and wet traction, but as well to a big disadvantage in processing. In the frame of this master thesis, the processing of different modified polymer types will be evaluated and optimized. This work will be carried out in co-operation with one important polymer supplier for the tire industry.

## Objective

The goal of this assignment is to study the processing behaviour of modified polymers in comparison to their unmodified counterparts. Besides, tailored processing conditions for the modified polymers will be elaborated.

## Assignment

### *Theoretical background*

The graduate student will start with a literature search into the various kinds of modified polymers used in tire compounding, with special attention to functionalities which interact with silica. Besides, the influence of processing conditions of silica-compounds as well as of the silica-polymer interactions on compound properties, with special attention to tire performance indicators, needs to be covered.

### *Sample preparation*

In agreement with Trinseo, a choice will be made for the modified polymers to be screened in silica compounds, and a test recipe will be defined. The compounds have to be mixed; part of this is the adjustment of the mixing conditions for an optimal dispersion and filler-polymer interaction. Next, the vulcanization has to be tailored, and samples for mechanical and dynamic mechanical testing will be produced.

### *Sample testing*

The mechanical and dynamic mechanical properties will be characterized using equipment available in the ETE labs. For special properties, it might be necessary to perform measurements in the Trinseo labs.

### *Evaluation*

Correlations between type of modified polymer, compounding and processing parameters with the final material properties have to be elaborated. A best practice for the use of these modified polymers for an optimal property profile as defined in agreement with Trinseo has to be elaborated.

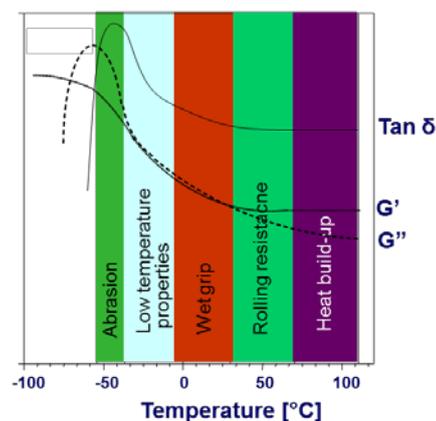


Fig. 1: The correlation between dynamic-mechanical properties of elastomers and tire properties

## Report

The graduation report should contain clear and precise conclusions regarding the influence of modification of the polymer on

- Processing
- Compounding
- Mechanical and dynamic properties
- Tire performance indicators such as the storage/loss modulus as well as the loss angle

## Partners

This project will be done in cooperation with **Trinseo**. This company is specialized in the development and production of high-quality elastomers.  
<http://www.trinseo.com>

## Contact

dr. ir. Wilma Dierkes  
w.k.dierkes@utwente.nl  
BH204

prof. Dr. Anke Blume  
a.blume@utwente.nl  
BH206