

Profiles and seals are made from elastomers, in particular acrylic rubber, hydrogenated nitrile rubber or chloroprene. In an earlier governmentally-subsidized project it was stated that the use of a special coupling agent together with silica, but as well together with carbon black as filler, significantly improves the dynamic behavior of these mechanical rubber goods. The presence of the coupling agent results in a specific filler-polymer interaction, which significantly influences the dynamic properties, e.g. hysteresis, storage and loss moduli, of the material. The normal function of a coupling agent is to establish a bond between the silica surface to the polymer. The intriguing question here is why a mixture of carbon black with the coupling agent also leads to a positive influence of the dynamic behavior as there is ample interaction between these two components.

Objective

Within this MSc assignment, a theory will be developed, how the coupling agent influences the dynamic properties of a profile or a seal compound.

Assignment

The graduate student will start with a literature search into the dynamic properties of elastomers and their correlation with material composition. In the practical part, the influence of the coupling agent on the dynamic behavior will be studied in detail. The composition of the elastomer compounds will be varied, e.g. just elastomer and coupling agent, systems of elastomer, silica and coupling agent, and a variant with carbon black instead of silica. The composite materials will be investigated regarding crosslink density and type of crosslink and their effect on dynamic properties. Bound rubber will be determined in order to distinguish between different kinds of interaction between polymer and filler. Stress strain curves will be evaluated and calculations of the crosslinking density with the help of the Mooney-Rivlin equation will be done. Finally, the dynamic properties of these compounds need to be investigated and correlations need to be made with the composition and other properties of these specific elastomeric composites.



Report

The graduation report comprises

- a discussion of the material composition and the effect on the structure of the composites,
- an overview of the properties depending on the composition,
- the correlations between material composition and dynamic properties.

Partners

This project will be done in cooperation with **EVONIK INDUSTRIES**.

The assignment will be performed in the labs of ETE.

Contact

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

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