Technische Universität Braunschweig

MUSEN

The dynamic flocculation model (DFM) for filled elastomers

From micromechanics to finite element implementation

Lecture of

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Webex Meeting:

https://bit.ly/musen-kolloquium-juhre
Meeting number: 2730 345 5231
Passwort: 9iTrDMPiQ26

A microstructure-based model of rubber reinforcement, the so-called dynamic flocculation model (DFM), is presented describing filler-induced stress softening and hysteresis by the breakdown and reaggregation of strained filler clusters. Good agreement between measurement and the model is obtained for filled elastomers like NR, SBR or EPDM, loaded along various deformation histories. One very important aspect is that the model parameters can be directly referred to physical properties.

This benefit can be used to extend the model to further essential effects like temperature- or time-dependent material behaviour. In case of filled elastomers these dependencies originate mainly from the filler-filler interactions. In the material model these interactions are characterized by two material parameters, the strength of the virgin filler cluster and the strength according to the broken or damaged filler clusters, respectively. Both parameters can be defined as functions of time and/or temperature, which is motivated by physical meaning.
The implementation of the model into the finite element method is realized by the concept of representative directions, with which a unification of one-dimensional models into a three-dimensional frame is provided.