Kolloquium Mechanik

RUHR-UNIVERSITÄT BOCHUM

UNIVERSITÄT DORTMUND

Vortragsankündigung

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Thema: **THE VISCOELASTIC BEHAVIOR OF PARTICLE-REINFORCED ELASTOMERS AT FINITE STRAINS**

Ort: **Ruhr-Universität Bochum**
Raum IAN 0018

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15:00 Uhr

Inhalt:

Constitutive equations are derived for the viscoelastic behavior of particle-reinforced rubbers at isothermal loading with finite strains. A filled rubber is thought of as a composite where inclusions with low concentrations of junctions between chains are randomly distributed in a host matrix. The characteristic size of inhomogeneities is assumed to substantially exceed the radius of gyration for macromolecules, on the one hand, and to be small compared to a size of a specimen, on the other. The regions with low concentration of junctions arise during the preparation of specimens (at the stages of mixing and vulcanization) due to the inhomogeneity in spatial distribution of a cross-linker. With reference to the theory of transient networks, the viscoelastic response of elastomers is ascribed to the thermally activated processes of breakage and reformation of active strands in the domains with low concentration of junctions. Stress–strain relations for particle-reinforced rubbers are developed by using the laws of thermodynamics. Adjustable parameters in the constitutive equations are found by fitting experimental data in tensile relaxation tests for several grades of unfilled and carbon black (CB) filled rubber. It is demonstrated that even at moderate finite deformations (with axial elongations up to 100 %), the characteristic rate of relaxation is noticeably affected by strains. Unlike glassy polymers, where the growth of longitudinal strain results in an increase in the rate of relaxation, the growth of the elongation ratio for natural rubbers implies a decrease in the relaxation rate, which is associated with mechanically induced crystallization of macromolecules.

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