

Development, Processing, Characterization, and Modelling of Advanced Elastomers

In the development of advanced elastomer materials we follow a holistic approach - RUBBERIOMICS®. This includes both theoretical and experimental consideration of

- Compatibility in heterophasic elastomers, i.e. filler-polymer-interaction
- Adaption of the mixing process
- Rheology as well as vulcanization behavior during processing
- Standard as well as non-conventional characterization of mechanical properties
- Constitutive modelling

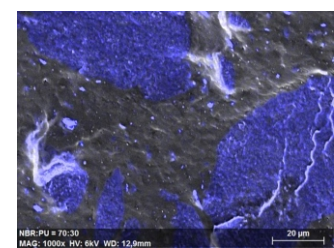
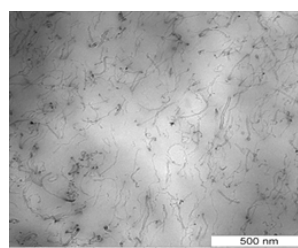
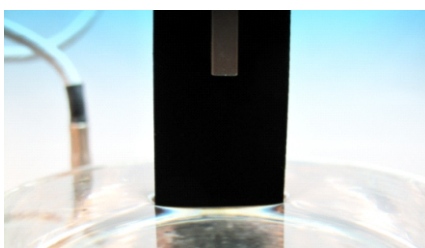
Conventional and Reactive Mixing of Elastomers

- Conventional mixing
- Reactive mixing, i.e. silanization in silica filled compounds
- Rubber nanocomposite preparation using liquid assisted dispersion methods
- Preparation of thermoplastic vulcanizates by dynamic vulcanization
- Visualization and simulation of flow and mixing processes in batch mixers



Interface Properties and Morphology of Filled Elastomers

- Determination of surface energy and polarity of fillers and polymers using wetting techniques
- Derivation of thermodynamic parameters for evaluation of dispersability, filler-polymer interaction and filler-filler interaction
- Characterization of filler dispersion in the compounds via optical and electron microscopy



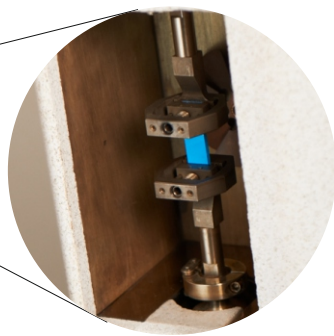
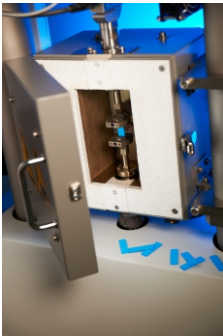
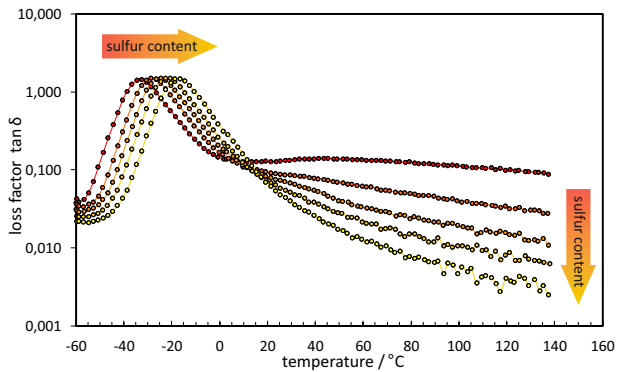
Rheology and Processability of Rubber Compounds and Thermoplastic Elastomers

- Mooney viscosity and capillary rheometry
- Characterization of extrusion behavior
- Characterization of non-linear visco-elastic behavior
- Studies of filler flocculation dynamics
- Curing behavior



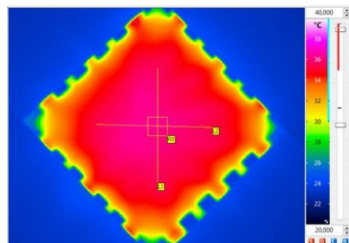
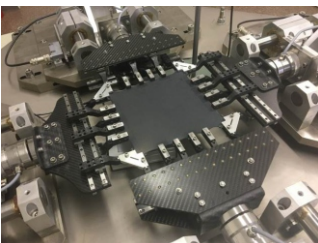
Dynamic Mechanical Spectroscopy

- Characterization of visco-elastic properties in the frequency domain
- Characterization of temperature-dependent visco-elastic properties
- Mastercurve construction
- Measurement of heat built-up



Multiaxial Characterization and Fracture Mechanics of Rubber

- Uni- and biaxial testing of elastomers
- Characterization of energy balance by online-IR-thermography
- Constitutive modelling with different established models
- 2-dimensional strain field analysis of whole samples and at distinct positions, e.g. crack tips, using digital image correlation
- Investigation of fatigue behavior
- Crack propagation in rubber materials
- Time-dependent and relaxation behavior under complex load
- Analysis of process- and deformation-induced morphology and structure evolution by X-ray tomography and scattering



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