



# 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
- Investigation of fatigue behavior
- Crack propagation in rubber materials
- Time-dependent and relaxation behavior under complex load



## Contact

#### Leibniz-Institut für Polymerforschung Dresden e. V. Department Elastomers

Dr. Sven Wießner, Dr. Klaus Werner Stöckelhuber e-mail: wiessner@ipfdd.de, stoeckelhuber@ipfdd.de P +49 (0)351 4658 468, 579 F +49 (0)351 4658 290

Hohe Straße 6 . 01069 Dresden . Germany www.ipfdd.de

Department Mechanics and Composite Materials Dr. Konrad Schneider e-mail: schneider@ipfdd.de P +49 (0)351 4658 296 F +49 (0)351 4658 362

