

Einladung zum Seminarvortrag im Aachener Mechanik & Statik Kolloquium

23. Juni 2017 | 11:00 Uhr

LuF Kontinuumsmechanik; Kackerstraße 9 | Seminarraum C 301

RWTH AACHEN
UNIVERSITY

„Molecular Scale Probing of Mechanical Damage in Polymeric Materials”

Professor Dr. Rint P. Sijbesma

**Supramolekular Polymer Chemistry
Eindhoven University of Technology, Niederlande**



Mechanically induced reactivity of polymeric materials has been known as a destructive force for a long time – it is the basis of molecular weight reducing techniques such as mastication and ultrasonic polymer degradation. However, recent developments are making it clear that mechanical forces on polymers may also be employed in a non-destructive way. Fully utilizing that feature of mechanochemistry requires a sophisticated approach with molecular level control over functionality engineered into the material.

Recently, we have shown that the incorporation of chemiluminescent dioxetane units in a polymer results in the emission of light when the strained four-membered ring opens under mechanical force.[1] This process probes mechanochemical chain scission with unprecedented spatial and temporal resolution, and has the capability to provide exceptionally detailed insight in the origins and mechanisms of failure in polymeric materials. An indication of the level of insight that may be garnered from the use of mechanoluminescent probes comes from a collaborative study of multiple networks, where the luminescent probes uniquely identified the nature of the toughening mechanism to be an increase in dissipative volume ahead of the crack.[2] In the presentation, I will highlight uses of dioxetane probes to tackle fundamental questions in materials science, where understanding of failure mechanisms is often lacking due to the limited possibility to probe events at the molecular scale. Examples will include irreversible softening in elastomers (Mullins effect), chain scission upon solvent swelling of glassy polymers, and the development of catalytic mechanoluminescent probes.

Prof. Dr.-Ing. M. Itskov, Lehr- und Forschungsgebiet für Kontinuumsmechanik, RWTH Aachen
Prof. Dr.-Ing. habil. S. Klinkel, Lehrstuhl für Baustatik und Baudynamik, RWTH Aachen
Prof. Dr.-Ing. B. Markert, Institut für Allgemeine Mechanik, RWTH Aachen
Prof. Dr.-Ing. S. Reese, Institut für Angewandte Mechanik, RWTH Aachen
Prof. K. Veroy-Grepl Ph.D., AICES, RWTH Aachen