

Workshop “Polymer Rheology – From the Liquid to the Solid State”

BAYREUTH, GERMANY
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Fundamental and applied aspects of polymer rheology were the subjects of a new workshop held in the city of Bayreuth. The workshop was organized by the Department of Polymer Engineering at the University of Bayreuth jointly with Anton Paar Germany GmbH, WEE-Solve GmbH and Neue Materialien Bayreuth GmbH. The seminar was addressed to all users who apply rheological methods. The concept of the workshop was positioned between seminars on basics of rheology and scientific conferences. The first day of the workshop was devoted to the variety of rheological methods. Application of these methods was the focus of the second day. The topics of the lectures were chosen in order to discuss and answer questions and problems of relevance for users from industry and research institutions.

After a welcome, Prof. Volker Altstädt presented the research and development center Neue Materialien Bayreuth GmbH. Then basics of rotational rheometry were discussed by Michael Schäffler (Anton Paar Germany). The application of different measurement modes in shear and examples of flow behaviour of daily life products were the subjects of his lecture. He explained relevant details of a variety of ex-

perimental techniques in shear. Andreas Eich (WEE-Solve) introduced the concept of linear viscoelasticity and the time-temperature superposition principle. The underlying ideas of these concepts were exemplified using shear oscillation measurements of polyisobutylene. Furthermore, the interrelation between molecular weight distribution of homopolymers and rheological properties was elucidated.

A lecture on extensional rheology of polymer melts was presented by Ulrich Handge (Polymer Engineering). He explained different experimental techniques in order to determine the extensional viscosity in different elongation modes. After the discussion of the basic aspects of shear and elongational rheology, dynamic-mechanical analysis (DMA) was the subject of two lectures. First Michael Schäffler gave an overview on the different experimental methods in order to determine the temperature-dependent properties using DMA. In the following lecture, Helmut Steininger (BASF SE) discussed in detail specific aspects of dynamic-mechanical analysis. Examples of experimental results of commercial materials elucidated the characteristics of the DMA technique. Polymer processing

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is intimately associated with the rheological properties of polymer melts. This interrelation was convincingly demonstrated by Iakovos Vitorias (Basell Polyolefine). Among other topics, he discussed the influence of long-chain branching on the extensional properties of polyolefins and the relevance to film blowing.

After the series of lectures of the first day, the participants had the chance to get an impression of the technological facilities of the Neue Materialien Bayreuth. The Neue Materialien Bayreuth is equipped with a large number of devices for processing on a large scale. In the evening of the first day, a visit and a dinner in "Maisel's Brewery Museum" gave all participants a further possibility for discussion.

The second day of the workshop was devoted to the application of rheological methods to industrially relevant polymer systems. Andreas Eich gave an overview on viscosity measurements of dilute polymer solutions. He explained commonly used experimental techniques and the analysis of experimental data. In the following lecture, Meik Ranft (BASF SE) discussed in detail the rheology of polymer dispersions. In these complex fluids, attractive and repulsive interactions strongly influence the flow behaviour. These phenomena were explained by showing several examples of commercial systems. Filled polymers are of high relevance for a large range of applications. Prof. Christian Friedrich (Albert Ludwigs University of Freiburg) elucidated the flow properties of complex fluids with dif-

ferent kind of fillers such as carbon nanotubes and graphenes. The appropriate interpretation of linear viscoelastic shear oscillations (using, e.g., van Gurp-Palmen plots) was one part of his lecture. Carbon nanotubes are characterized by a unique combination of mechanical, electrical and thermal properties. The simultaneous measurement of rheological and electrical properties in shear flows was the topic of the lecture of Dick J. Dijkstra (Bayer MaterialScience AG). He discussed the interplay of the microstructure of composites of polycarbonate and Baytubes® and their flow properties. Blends of two immiscible polymers are an example of multicomponent polymeric materials. Interfacial phenomena play an essential role in these systems. Prof. Bernhard Wolf (Johannes-Gutenberg-University Mainz) explained fundamental phenomena which influence breakup and coalescence of droplets in two-phase polymer blends. Finally, Patrick Heyer (Anton Paar Germany) gave an overview on additional experimental techniques. Dielectric measurements and rheo-optical experiments are powerful tools in order to get further insight into the flow behaviour of polymer materials.

The large number of participants of the workshop held at the Neue Materialien Bayreuth showed that polymer melt rheology is associated with a variety of very efficient techniques and interesting phenomena. A subsequent workshop will be held in Bayreuth on November 14–16, 2011.

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