field and 3 poster award was given for the best poster presentation. 76 researchers participated in the poster presentation. Delegates indicated that the conference had given them an opportunity to meet reputed scientists from many countries of the world to exchange ideas and share research experiences on recent advancements in natural polymers and biomaterials. The delegates came forward to give their valuable comments, to introduce more number of plenary lectures in the next conference. All the distinguished guests thanked the organizers for their hospitality, grant cultural session and the wonderful boat trip through Vembanad Lake. The conference ended on a good note.

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Geesthacht Polymer Days: Rheology and Mechanics of Polymer Materials

Geesthacht, Germany
November 13 – 14, 2012

In order to present the foundations and applications of rheological and mechanical testing methods, the Institute of Polymer Research of the Helmholtz-Zentrum Geesthacht in cooperation with Anton Paar Germany GmbH and the Department of Polymer Engineering of the University of Bayreuth organized a two-days workshop for all users who benefit from the analysis of viscoelastic properties of materials. The workshop took place at the Helmholtz-Zentrum Geesthacht on November 13 and 14, 2012. The idea of the workshop was to present lectures on test methods and experimental phenomena of polymer materials. The seminar was addressed to scientists, engineers and technicians who apply rheological and mechanical testing methods in their daily life. Around 40 participants from academia and industry joined the Geesthacht Polymer Days which were organized for the first time.

After a welcome, Volker Abetz (Institute of Polymer Research, Helmholtz-Zentrum Geesthacht) gave an introduction into the research activities of the Institute of Polymer Research. The development of polymer membranes covering synthesis, characterization and pilot plants is the principal research activity of the institute. Then Alexander Kutter (Anton Paar Germany GmbH) presented the fundamentals of shear rheology. In his illustrative lecture, A. Kutter discussed the different measurement modes in oscillation and rotation, experimental techniques and different sources of error in rheological testing. Andreas Eich (SI Analytics) showed how shear oscillations in the linear viscoelastic range can be applied in order to analyze molecular characteristics of polymers. He chose poly(isobutylene) as an example. Beside shear deformation, the rheology of complex fluids in elongation is highly important in applications. Therefore the lecture of Ulrich A. Handge (Institute of Polymer Research, Helmholtz-Zentrum Geesthacht) was devoted to experimental techniques of extensional rheometry of polymer melts and solutions. He discussed a variety of apparatus which are used for the determination of the extensional viscosity and presented experimental results.

After the lunch break, Georg H. Michler (Martin-Luther University Halle-Wittenberg) gave a very illustrative introduction into the morphological properties of polymer materials. The microstructure of polymer materials strongly influences the mechanical and rheological properties of these materials. Electron and atomic force microscopy investigations are very suitable methods in order to analyze the structure of polymer materials in the sub-micron range. The measurement of the viscosity of low viscous polymer solutions is another important task which occurs in daily laboratory life. Andreas Eich discussed in another lecture different techniques in order to measure the viscosity of

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Figure 1 (left): The lecture of Meik Ranft was devoted to the "Rheology of Polymer Dispersions" (Ulrich Handge, Helmholtz-Zentrum Geesthacht).

Figure 2: Around 40 participants joined the Geesthacht Polymer Days (Heidrun Hillen, Helmholtz-Zentrum Geesthacht).

these liquids. The advantages and disadvantages of the techniques were also explained. In the last lecture of the first day, Meik Ranft (BASF SE) elucidated that polymer dispersions are a very important class of polymer fluids. He demonstrated that the rheological properties of polymer dispersions are associated with very interesting phenomena such as shear thinning and shear thickening. After a presentation of the experimental facilities for membrane fabrication of the Institute of Polymer Research of the Helmholtz-Zentrum Geesthacht, the participants of the workshop were invited to a guided tour through the docklands of Hamburg (so-called Speicherstadt) and finally joined a get-together in Gröninger's Brauhaus.

The second day of the workshop was intended to present applications of the experimental techniques to technological problems. The first lecture of the second day was given by Iakovos Vittorias (LyndellBasell Industries). His research covers the rheology of polyolefines. Strain-hardening and strain-induced crystallization of branched polyolefines are topics which are highly relevant for industrial applications. In his lecture he showed how rheological methods can be applied in order to elucidate these complex phenomena. Rheological methods can be also combined with other experimental techniques. Important examples are Rheo-SAXS measurements and the combination of rheological and dielectric measurements. Alexander Kutter gave an introduction into these experimental methods. The rheology of filled polymers is another example for complex behaviour of polymer materials. In a very interesting lecture, Christian Friedrich (Albert-Ludwigs-University of Freiburg im Breisgau) discussed in detail the foundations of polymer nanocomposites. Filler-filler interactions, liquid-solid transition and aggregation phenomena were topics of his lecture which elucidated the viscoelastic properties of these materials. The uniform dispersion of nanofillers in polymer matrices is an important task in polymer processing. The application of electrical measurements during processing is one method in order to get in-situ information about the evolution of the filler network, e.g., in polymer composites which are filled with carbon nanotubes. In the stimulating lecture of Joachim Radusch (Martin-Luther University Halle-Wittenberg), these aspects were studied in detail. J. Radusch presented very interesting methods and experimental results which can be applied for dispersion problems in industry.

Dynamic-mechanical-thermal analysis (DMTA) can be used in order to determine the thermal transitions of polymer materials. These measurements have to be performed by carefully choosing the experimental parameters. Helmut Steininger (BASF SE) discussed these issues in his very comprehensive lecture. The viscoelastic properties of filled elastomers are highly relevant for the automotive industry, e.g., for tire applications. The fillers usually form aggregated clusters in the elastomeric matrix. The rheology of such structured materials was thoroughly discussed in the inspiring lecture of Gert Heinrich (Leibniz Institute of Polymer Research Dresden e.V.). In the final lecture of the workshop, Volker Altstädt (University of Bayreuth) explained the mechanical and fracture-mechanical properties of polymers and polymer composites. In his very illustrative lecture, he deeply discussed elastic and plastic behavior of polymer materials and experimental methods to analyze the mechanical properties of these materials. In addition, he explained the theoretical foundations of these highly important methods.

In summary, the Geesthacht Polymer Days on "Rheology and Mechanics of Polymer Materials" presented a comprehensive overview on the viscoelastic properties of polymer materials and the use of mechanical, dielectric and rheological testing methods in industry. In 2013, the Geesthacht Polymer Days will focus on membrane technology.

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