

POTSDAM, GERMANY  
MAY 16 – 18, 2011

Figure 1:  
Participants of the 4<sup>th</sup> User Seminar for 2D and 3D Rheology and Stability in front of the steamer "Gustav", on which the participants made an excursion on the rivers and lakes of Potsdam and enjoyed their dinner.



For the 4<sup>th</sup> time the three day lasting "User Seminar on 2D and 3D Rheology and Stability of Disperse Systems" took place in the conference hotel "Am Templiner See" in Potsdam. In addition to lectures and talks, the participants took part in workshops and case studies, where they worked on practical situations engineers encounter in their daily work. Anton Paar Germany GmbH (Ostfildern, [www.anton-paar.com](http://www.anton-paar.com)), LUM GmbH (Berlin, [www.lum-gmbh.com](http://www.lum-gmbh.com)) and SINTERFACE Technologies (Berlin, [www.sinterface.com](http://www.sinterface.com)) organized this event in a joint venture. As in the years before the venue provided a perfect setting for the seminar, as it offers all the professional services needed to organize a workshop, along with the housing and relaxation after work. Participants (see photo of Fig. 1) as well as the lecturers came from academia and industry, providing a perfect mixture between theory and application. As all participants were from Germany, Austria and Switzerland all lectures were given in German. Lecturers came from the three organizing companies Anton Paar, LUM GmbH and SINTERFACE, as well as guest lecturers from academia of the TU Berlin, ETH Zurich, MPI of Colloids and Interfaces, Georg Simon Ohm University of Applied Sciences, the Karlsruher Institute of Technologies (KIT) and University of Erlangen-Nuremberg and from the industrial research and development departments of Nestlé and Schwan-STABILO.

The seminar focused on dealing with rheology (at interfaces and in the bulk) and stability of disperse systems, therefore introductory lectures on rheology in rotation and oscillation (M. Schäfler and A. Kutter, Ostfildern) and on defining sta-

bility on the basics of colloidal science (D. Lerche, Berlin) and measuring stability directly in real-time and accelerated ways, applying the STEP-technology® (A. Uhl, Berlin). The following lectures dealt with specific topics. Patrick Heyer (Ostfildern) introduced the combination of rheology and optical methods, H. Schnablegger (Graz) of small and wide angle scattering, providing the opportunity of measuring additional structural sample characteristics in addition to their rheology. As an outcome it could be shown that these additional information lead to a variety of new practical applications in science and technology.

Most of the materials applied in modern technologies are of composite character. For example, emulsions, foams and dispersions (or combinations of them) are typically treated as a homogeneous material like in process engineering, although they consist of subunits with their own mechanical behavior. Using emulsions as example, their droplets' surfaces are sheared or compressed/expanded during rheological measurements or processes. During these loads, their surface characteristics like the interfacial tension or viscoelasticity play an important role. Although this interaction is not yet fully understood and still subject of ongoing research, this fact demonstrates the close link between 2D (interfacial) and 3D (bulk) properties and its importance for developing new formulations and dispersion stability.

After a general introduction into 2D rheology a number of experimental tools and a few selected applications were presented. R. Miller (Potsdam) discussed existing instruments for measuring 2D rheology in shear or dilatation with their field of application and advantages and disadvantages. For measuring the interfacial tension and elastic properties J. Krägel and R. Miller (Potsdam) introduced principals based on measuring capillary pressure in droplets and bubbles. Furthermore, the relationship between the rheological behaviour (Newtonian, Non-Newtonian, network forming) of the continuous phase and dispersion stability was discussed in detail (D. Lerche). K.H. Jacob (Nuremberg) presented and introduced methods for comparing stability measurements based on rheology (Physica MCR) and particle separation (LUMiFuge®) of emulsions. The separation velocities, obtained by analytical centrifugation (LUMiFuge®) as the main criterion for the stability ranking of the emulsions are in accordance with rheological results from frequency

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sweeps and amplitude sweeps. Synergy effects based on emulsifier combinations were predicted from the separation velocities of the individual components alone and proven experimentally by rheological tests and accelerated stability tests by analytical centrifugation.

A. Wierschem (Erlangen) showed, that rheometers are also able to measure interfacial elastic properties of small particles. Therefore, elastic spheres like cells are “clamped” between a narrow gap plate-plate geometry and loaded with an oscillation. The resulting response gives a measure of the elastic properties of the cell ensemble, which can be related to the single cell. This application demands very accurate position, torque and strain measurement and control capabilities of the used rheometer.

The talk given by P. Fischer (Zurich) gave another example on the application of interfacial and bulk rheology, based on results on the interfacial behavior of beta-lactoglobulin and ovalbumin as surfactants. Food material provide a wide range of matrices, where interfaces define and determine the rheological bulk behavior. Rheological studies of complex fluids in food processing were the topic of the contributions of further authors. J. Engmann (Lausanne) showed the role

in characterizing the texture of food products and on the perception of consumers. B. Senge (Berlin) gave an overview on structure formation and measurement in foods based on pectins and hydrocolloids. H. Schuchmann (Karlsruhe) focused on the application of rheology in process and product design. Also the emerging and important field of foam rheology was covered by the lecture given by A. Berthold (Berlin). M. Schmitt (Heroldsberg) reported on the potential and limits of rheological analysis of emulsions, suspensions and gels.

After these interesting talks a workshop with case studies followed, accompanied with a “hands on session” on exhibited measuring devices. J. Engmann and M. Schmitt hosted this session and participants were asked to solve practical “every day” process engineering tasks from the field of cosmetics and food. According to the participants feedback this seminar and the fusion of theory and application was a full success. Furthermore the evening program like the boat trip on the original and restored steamer “Gustav” (see Fig. 1) offered the time for socializing and discussions.

Alexander Kutter

[alexander.kutter@anton-paar.com](mailto:alexander.kutter@anton-paar.com)

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