ADVANCED RHEOMETRICAL TECHNOLOGIES

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The aim of the symposium is to present new developments in the area of rotational rheometry.

The main improvements in rotational rheometers over the past years has been in the performance of the motor technology, thus enabling new techniques like LAOS (Large Amplitude Oscillatory Shear) testing, and the development of new accessories, which broaden the application range of modern rheometer.

The main components of a rotational rheometer are the motor with its supporting bearings systems and the force measurement. In 1995 Anton Paar introduced a rheometer equipped with an electronically commutated synchronous Motor (EC-Motor) and Digital Signal Processor (DSP) technology. In the meantime the EC-motor technology is now for 16 years and in the third generation of instruments commercially available, making the technology with more than 3000 installations word wide well established. Since its first introduction, significant improvements have been implemented due to the use of enhanced electronics, improved materials, and more sophisticated control mechanisms.

Rheological measurements reveal information on macroscopic material properties. The combination of additional techniques with rheological measurements became more popular in recent years. These methods can be distinguished into three main categories.

The first contains techniques, which give additional structural information and are valuable for a better understanding of the rheological behavior. The simultaneous use of rheological and structural information techniques is helpful to gain a better understanding of the dependencies between the microstructure and the mechanical properties of complex fluids. Optical techniques like Small-Angle-Light-Scattering (SALS), microscopy or birefringence and dichroism measurements have been widely used in combination with rheology. Related techniques are Rheo-Small-Angle-X-ray (SAXS) and Neutron (SANS) Scattering and Dielectrical measurements.

The second category includes all cases in which the rheological behavior as a function of an additional parameter is studied, e.g. UV-curing or the measurements at elevated pressures. There are also specially designed devices for magneto- or electrorheology allowing the investigation of the changes in the rheological parameters as a function of applied external fields.

The third category contains systems transforming the rotational movement of the rheometer into different types flow conditions. Examples are extensional rheology tools or geometries allowing to measure two dimensional interfacial shear rheological properties of monolayers at the interface between two liquids. Devices turning the rheometer into a tribometer are part of this category as well.