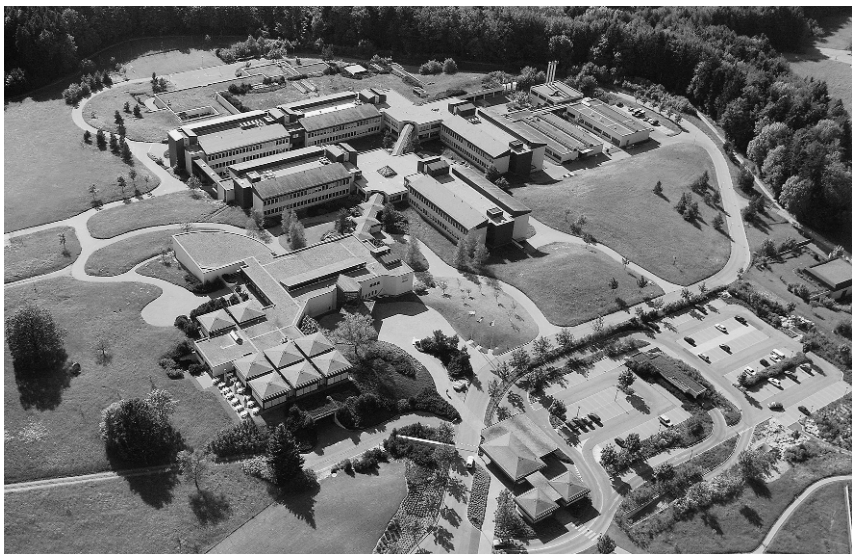
# Interfaces and Rheology
## Spring Meeting of the Swiss Group of Rheology of the Polymer Group of Switzerland in Lausanne, Switzerland, May 5th, 1999

*Nestlé Research Centre, Lausanne, Switzerland*



A warm welcome was given by A. Luciani (EPFL, Lausanne) who gave a short introduction to the Swiss Group of Rheology and H. Watzke (Nestlé, Lausanne) who presented the hosting Nestlé Company. The Swiss Group of Rheology is a special interest group of the Polymer Group of Switzerland and was formed in March 1993. Its main goal is to promote the research and teaching of rheology and its practical application, to bring together those interested in rheology and its practical applications, and to cultivate contacts with national and international organizations. The Swiss Group of Rheology had 72 members in 1998.

Nestlé is the world's largest food producer. The Swiss based company conducts fundamental research in 15 Nestec research centers worldwide. The hosting Nestlé Research Centre is the main research facility dealing with fundamental investigations in foodstuff. Roughly 400 people from 40 nations are employed here.

H.C. Oettinger (ETH Zürich, Switzerland) opened the scientific part of the meeting. The program consisted of two plenary lectures given by prominent scientists in the field of polymer research and four additional invited presentations by industrial and academic researchers dealing with interfaces and rheology.

The first plenary talk entitled "Interfacial dynamics at different length scales" (see also interview in this issue) was given by Masao Doi (Nagoya, Japan) who focused on modeling aspects to understand basic flow mechanisms of polymer blends and copolymers. In this contribution it was shown how to predict morphological and rheological characteristics of polymeric fluids on macroscopic length scales, using mean field descriptions and taking into account the microscopic characteristics of the system. By using computer simulations a set of equations of the Navier Stokes type were solved in two dimensions, combining hydrodynamics, physicochemical reactions and coagulation processes, which may occur in multiphase systems. In order to solve problems which couple different length scales, he the development of hierarchical and multiscale algorithms is strongly recommended.

The talk of A. Luciani (EPFL, Lausanne) concerned the experimental determination of interfacial tension in polymer blends. This is an important quantity for the characterization of polymer blends since the rheology of these systems depends on the interfacial properties of the involved phases. Therefore, knowledge and evaluation of the interfacial tension is of importance – the more as theoretical models are still not sufficiently elaborated to predict this material property in complex polymeric systems. Experimental methods to determine the interfacial tension are subdivided in equilibrium and dynamical methods. The main shortcoming of equilibrium methods (e. g. the pendent-drop- or the spinning drop-technique) is that they work only for liquids of low viscosity. Consequently, the interplay of interfacial tension and rheology is well understood for liquids of low molecular weight. Dynamic methods (e. g. the drop retraction-method) can be applied to determine the interfacial tension of materials with high viscosity in shear as well as in elongational flow and to understand their flow behavior. This has been undertaken successfully for a PE/PS blend and for hyperbranched polymers.

In the third talk of the morning session R. Williams (University of Wales, Swansea) reported on recent developments of rheometers for a higher frequency range ("New rheometry for characterization of polymer solutions"). A virtual gap

geometry for a new rheometer was presented which consists of three parallel plates: two outer plates are fixed, whereas the inner plate can perform in plane oscillations. Due to these oscillations perturbations in the form of waves will propagate to the outer plates. With this rheometer it should be possible to determine the relationship between the frequency dependence of the elastic and the phase velocity of the waves.

*Cathedral of Lausanne, Lake Geneva, and the Savoien Alps. Lausanne is the capital of the canton Waadt. It is seat of the International Olympic Committee (IOC); its economic power in the past has been mainly due to textile and food industry.*

The afternoon session started with the second plenary lecture given by L.A. Utracki (NRC-IMI, Canada) who presented an overview on "Melt flow and mixing of polymer blends". The rheology of immiscible blends with their multiphase character was reviewed in the first part of Prof. Utracki's contribution. A second part of the contribution dealt with mixing of polymer blends in shear and elongational flows. Since the Reynolds numbers achieved in shear flows of polymer blends are very low mixing in such a flow is not very efficient. In elongation flow, however, mixing is more efficient due to the absence of rotational effects. This insight of mixing has been made available to industry and permits the generation of mixing rates comparable to those obtained in an extruder.

E. Windhab (ETH Zürich, Switzerland) continued with a talk on the "Influence of disperse phase morphology on the rheology of concentrated food suspensions and emulsions" He presented recent work on a model to characterize rheological properties of suspensions can be describe by the release of entrapped solvent fluid. The FIMS (Fluid Immobilization Model for Suspensions) uses the relation between surface and volume immobilization to define the effective volume fraction acting in flow and, consequently effects the flow curves. The FIMS model can be used for chocolate model systems, fiber and sphere suspensions as well as for emulsions because both shear-thickening/dilatant and shear-thinning/thixotropic behavior can be adjusted be ration of surface and volume immobilization.

C. Bispering (Nestec, Switzerland) closed the session with a contribution on "The importance of surface rheology in modern food manufacturing". The area of surface rheology is important for food industry since many multiphase systems can be found during the processing of food stuffs as well as among final food products. Surface rheology is a particularly useful tool for characterizing and adjusting multiphase systems met in food processing and consequently for optimizing the quality of the processed foodstuffs.

The poster session offered interesting contributions from experimental research as well as theoretical research. It consisted of approximately 20 contributions ranging from theoretical rheology and nonequilibrium thermodynamics to properties of synthetic polymers and foodstuffs. The next meeting of the Swiss Group of Rheology of the Polymer Group of Switzerland will be held in Zürich in Oct 1999. The exact day and place will be announced at
**http://www.ar.ethz.ch/FR/**
and in the conference overview of Applied Rheology (p. 95). Detailed information regarding the Nestlé research activities can be found at
**http://www.nestle.ch/**.

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This is an extract of the complete reprint-pdf, available at the Applied Rheology website
http://www.appliedrheology.org