



# Physikalisches Kolloquium

Norbert Willenbacher, Universität Karlsruhe

»Nanoscience using bulk mechanical measurements«

*Einführung: H. Kalt*

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Rheology is a highly interdisciplinary subject including aspects of physics, chemistry, biology and engineering dealing with the flow of matter. Besides classical process engineering topics, the relationship between bulk rheological properties of complex fluids and the molecular or supramolecular properties of their constituents has attracted more and more attention.

This talk focuses on recent developments regarding high frequency mechanical rheology as well as optical techniques allowing to deduce linear-viscoelastic properties of fluids from the Brownian motion of tracer particles.

The following topics are addressed:

- in-situ determination of the interaction potential among colloidal particles from high frequency rheometry [1, 2]
- validity of the Stokes-Einstein equation in concentrated suspensions [3]
- determination of the persistence length (= bending stiffness) of self-assembling systems like surfactant micelles and protein filaments or other semi-flexible objects using diffusing wave spectroscopy (DWS) [4]
- determination of linear viscoelastic properties of heterogeneous solutions on the micron scale using fluorescence microscopy

[1] G. Fritz, N. Willenbacher, and N.J. Wagner, *High Frequency Rheology of Complex Fluids from Torsional Resonance Oscillation at Multiple Frequencies*, J. Rheol. 47(2), 303-319 (2003)

[2] G. Fritz, V. Schädler, N. Willenbacher, and N.J. Wagner, *Electrosteric Stabilization of Colloidal Dispersions*, Langmuir 18, 6381-6390 (2002)

[3] J. Bergenholtz, F. M. Horn, W. Richtering, N. Willenbacher, N. J. Wagner, *Relationship Between Short-time Self-diffusion and High Frequency Viscosity in Charge Stabilized Dispersions*, Physical Review E, Rapid Communications, 58 (4), 4088-4091 (1998)

[4] N. Willenbacher, C. Oelschlaeger, M. Schopferer, P. Fischer, F. Cardinaux and F. Scheffold, *Broad Bandwidth Optical and Mechanical Rheometry of Wormlike Micelle Solutions*, accepted for publication Physical Review Letters (2007)

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**Freitag, 11.01.2008, 17 Uhr c.t.,**

**Universität Karlsruhe (TH), Otto-Lehmann-Hörsaal, Physik-Flachbau (Geb. 30.22).**

**Anschließend Nachsitzung im Gastdozentenhaus „Heinrich Hertz“**