Viscometry using Bright-Field Microscopy

This laboratory session introduces the principles and applications of **viscometry** through the use of **Differential Dynamic Microscopy (DDM)**. The practice is designed to provide students with both theoretical understanding and practical skills for quantifying fluid viscosity on the microscopic scale using conventional bright-field microscopy.

Differential Dynamic Microscopy (DDM) is an image analysis technique that extracts dynamic information from time series of microscopy images. By computing spatial Fourier transforms of image differences, DDM yields correlation functions equivalent to those obtained in dynamic light scattering, but with the advantage of being compatible with simple optical setups. Through this approach, the motion of tracer particles can be analyzed to determine transport properties such as diffusion coefficients, which in turn are related to the viscosity of the surrounding medium.

As part of the session, students will acquire **basic knowledge of optical microscopy** and will learn how to perform **particle sizing of colloidal systems**, complementing the viscometry analysis.

Applications of Viscometry extend across both research and industry:

- In biophysics and medical sciences, to investigate the mechanical properties of cells, tissues, and biological fluids.
- In pharmaceutical research, for evaluating drug formulations and delivery systems.
- In food science and cosmetics, to monitor stability, consistency, and texture.
- In industrial chemistry, to characterize complex fluids such as lubricants, inks, and coatings.

By the end of this practice, students will gain direct experience in applying DDM for quantitative viscometry, while also developing skills in microscopy and system characterization.

The experiment lasts two days (four hours each) and is carried out in groups of two students. Instructions and additional information will be sent after making an appointment. To schedule an appointment, please contact Dr. Manuel Escobedo (escobedo@hhu.de)