Friedrich-Alexander-Universität
Technische Fakultät

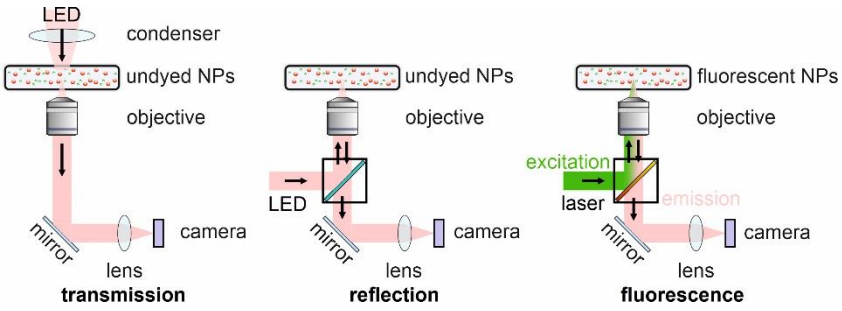
The **Institute of Advanced Optical Technologies – Thermophysical Properties (AOT-TP)** offers a

Master thesis

with the tentative title

Characterization of Particle Diffusion by Differential Dynamic Microscopy

Accurate knowledge of particle diffusion coefficient *D* in free media and in porous media over a wide range of thermodynamic states including particle concentration and temperature is important in many technical processes, e.g., particle chromatography. Currently, at AOT-TP, a near-field light scattering setup based on the differential dynamic microscopy (DDM) is under development for the accurate determination of *D* at macroscopic thermodynamic equilibrium. DDM is based on the analysis of the dynamics of fluctuations in particle number density, which is accessed by a series of microscopic images of the dispersion containing nanoparticles (NPs). For this, an optical microscope and a high-speed camera is used.



The main tasks of the master thesis are given as follows. Firstly, the student should contribute to the further development of an existing experimental setup by implementing an active temperature control for the complete system. Due to the limited space available in the microscope, it is difficult to achieve a homogeneous temperature field over the complete sample cell. Therefore, a second temperature control system for the entire microscope should be developed. In a second step, a validation of the setup should be performed by studying reference NPs which were already investigated by dynamic light scattering (DLS). Within a third step, different configurations of the setup should be applied and checked for the accurate determination of *D* in free media as well as under the confinement of a porous media. The results should contribute to a protocol serving as guideline for future DDM experiments where the advantages of different configurations can be utilized.

For the master thesis, we are looking for a committed student with interests in optical metrology, control technology, image processing and thermophysical property research. We offer a diverse, multidisciplinary, and international working environment with excellent potential for scientific and personal development.

Start of the thesis: as soon as possible

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