

REAL TIME STABILIZATION OF NANOSCALE CHEMICAL IMAGING

Nanoscale Chemical Imaging using AFM and MIR

The combination of mid infrared (MIR) absorption spectroscopy and atomic force microscopy (AFM) enables us to determine distributions of molecules at nanometer spatial resolution. This AFM-IR approach enables us to image and analyze organelles inside cells and microorganisms, to determine the secondary structure of individual proteins, phases of polymers, composition and defects in energy materials (organic inorganic perovskites, metal-organic frameworks,...) and among many others. (See the following publication for a recent example: <https://doi.org/10.1515/nanoph-2020-0048>)

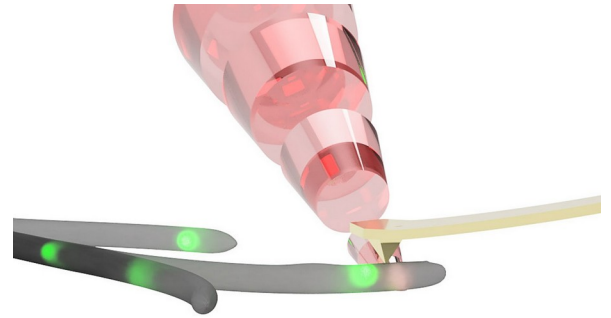


Figure 1: rendering of AFM-IR imaging a fungal hypha

The AFM-IR approach yields a signal that is proportional to MIR absorption – as long as experiment parameters are kept constant. Therefore, for reliable nanoscale AFM-IR imaging and spectroscopy, real-time control of these parameters is required.

Outline of thesis project

This project lies at the intersection between AFM instrumentation (Schitter group, <https://www.acin.tuwien.ac.at>) and analytical chemistry/laser spectroscopy (Georg Ramer, www.cta.tuwien.ac.at/nano). Your goal will be to enable real time, active compensation of mechanical artefacts in the AFM-IR signal. The project has three successive steps:

1. modeling of AFM-IR signal transduction
2. design and construction of control for real time compensation
3. integration with an existing AFM-IR instrument

Requirements

- Bachelor in electrical engineering, mechanical engineering, mechatronics, physics or similar
- Interest in instrument development, creative problem solving
- Fluency in either German or English
- Tentative duration: 6 months
- Salary: € 1,105.00 for 20 h/week

Send your application (including academic CV, max. 2 pages) to georg.ramer@tuwien.ac.at

Contacts

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