



# EINLADUNG zum IFP-SEMINAR

## Nanomechanical infrared detectors: Towards single-molecule absorption spectroscopy

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Host: Silke Bühler-Paschen  
Termin: Mittwoch, 21. November 2018, 16:00 Uhr  
Ort: Institut für Festkörperphysik, TU Wien  
Wiedner Hauptstraße 8-10, 1040 Wien  
Seminarraum DC rot 07 (roter Bereich, 7. OG)

### Abstract:

Nanomechanical drum resonators made of 50 nm thick silicon nitride respond strongly to changes in temperature. We use this high temperature responsivity to detect the photothermal heating by absorbed infrared light. We reach unprecedented sensitivities in the femto-watt regime at room temperature. These are sensitivities which are otherwise only obtainable with cryogenically cooled detectors. This has allowed us to measure the infrared absorption spectrum of probe material of only few pico-grams [1]. Recently, with an optimised silicon nitride drums we have reached single-molecule sensitivity. This has allowed us to perform non-fluorescent single-molecule absorption microscopy with a signal-to-noise ratio of  $>70$  [2]. This unprecedented sensitivity opens up an array of new and improved possibilities in the field of single-molecule IR spectroscopy.

[1] M. Kurek, M. Carnoy, P. E. Larsen, L. H. Nielsen, O. Hansen, T. Rades, S. Schmid, and A. Boisen, Nanomechanical Infrared Spectroscopy with Vibrating Filters for Pharmaceutical Analysis, *Angew. Chemie Int. Ed.*, vol. 56, pp. 3901–3905, 2017.

[2] M.-H. Chien, M. Brameshuber, B. K. Rossboth, G. J. Schütz, and S. Schmid, Single-molecule optical absorption imaging by nanomechanical photothermal sensing, *Proc. Natl. Acad. Sci.*, vol. 115, no. 44, pp. 11150–11155, 2018.