Bundesministerium
für Bildung
und Forschung

Open Master Thesis topic:

“Reversible tuning of single nanoantennas using nanosecond laser pulses”

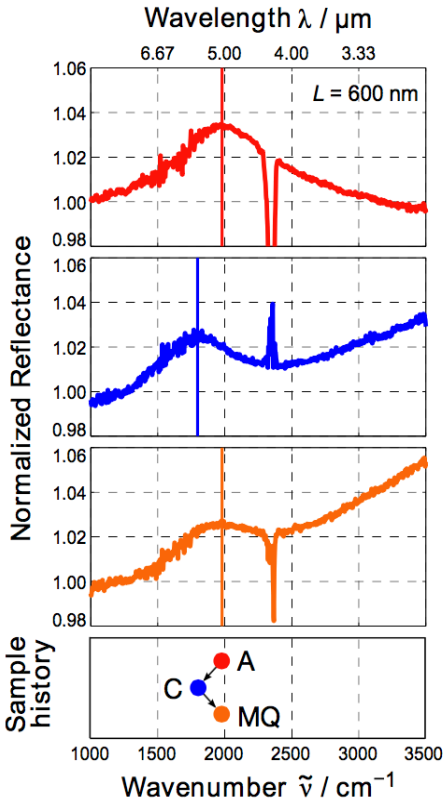
Motivation:

Optically resonant thin film systems that are structured on the nanometer scale offer comprehensive control over light fields. Despite their nanometer thickness, these **nanofilms can be used for the creation, detection and transformation of light**. For optimal functionality, they need to be freely programmable and have low optical losses, however. This is subject of **current research** in the BMBF project “Nanofilm”.

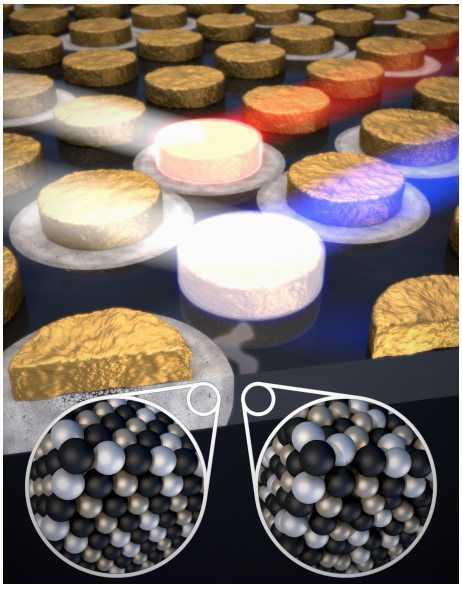
Phase-change materials (PCMs) have a high optical contrast between their amorphous and crystalline phases, while having low optical losses in the infrared[1]. Moreover, they can be switched between phases with short high-energy laser pulses.

The resonance of a **metallic infrared antenna** covered with a PCM can therefore be shifted spectrally by simply changing the phase of the PCM. With our **custom, automated laser setup** it is possible to address single nanoantennas directly and switch them locally with nanosecond laser pulses.

[1] M. Wuttig *et al.*, Nat. Phot. 11, 465 (2017)



A.-K. Michel, PhD Thesis, RWTH Aachen (2016)



By courtesy of Julian Barnett (2017)

Task:

The goal of the thesis is to **analyze and understand the influence of multiple reversible switching of single nanoantennas** covered by the PCM $Ge_3Sb_2Te_6$ with ns-laser pulses. The student will use the custom laser setup (stylized in left image) for reversible switching of the antennas and investigate the changes in the far-field response of the antennas with FTIR microscopy (see top image).
The student will produce new antennas with electron beam lithography or focused ion beam milling and supplement his far-field measurements with computational simulations and AFM measurements. He/she will especially aim to increase the number of switching cycles far beyond the presently achieved ones.

Please feel free to contact me:
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