ir nano | RWTH AACHEN UNIVERSITY

Bundesministerium für Bildung und Forschung

Open Master Thesis topic:

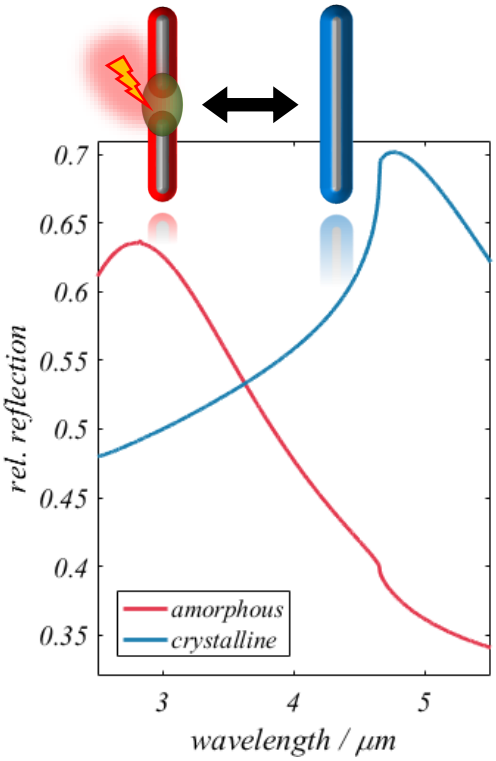
"Highly Conductive Phase-Change Materials for Nanoantenna Resonance Tuning"

Motivation:

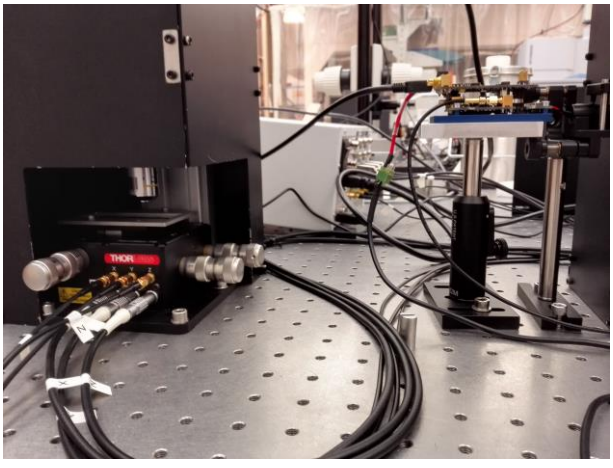
Optically resonant thin film systems that are structured on the nanometer scale offer comprehensive control over light fields. Despite their nanometer thickness, these **nanofilms can be used for the creation, detection and transformation of light**. For optimal functionality, they need to be freely 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[1]. In the infrared, some PCMs can become conductive in their crystalline phase. Moreover, we can switch between the phases with nanosecond laser pulses.

The resonances of **metallic infrared nanoantennas** are fundamentally connected to the antenna length. With metallic PCMs it is now possible to dramatically change antenna resonances by combining neighboring antennas or by just "writing" the nanoantennas directly into the amorphous PCM matrix with a laser.



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



Task:

The goal of the thesis is to **use conductive PCMs for resonance tuning of metallic nanostructures.** The student will first simulate and model different tuning geometries. He/she will then continue to fabricate the samples with modern fabrication methods like electron beam lithography or focused ion beam milling. Next, he/she will use our custom laser setup (see left image) for optical switching of the PCMs and characterize the samples in the far-field with FTIR microscopy (see top image). Scanning electron microscopy and atomic force microscopy will be employed for further characterization.

Please feel free to contact me:
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