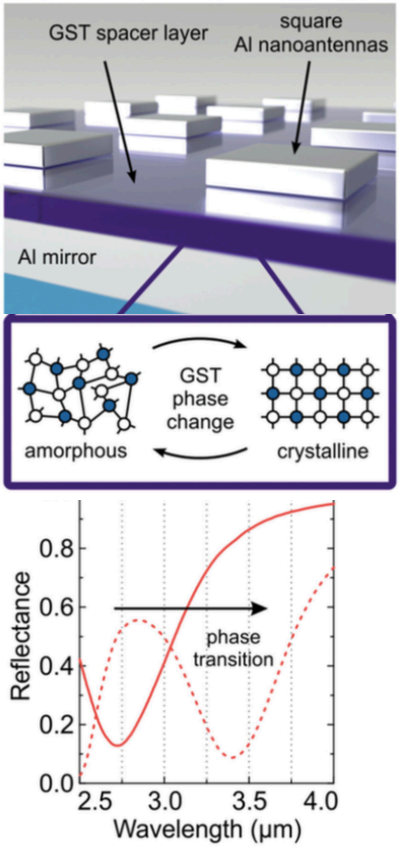
ir nano | RWTH AACHEN UNIVERSITY

Bundesministerium für Bildung und Forschung

Open Master Thesis topic:

"Reversible optical switching of phase-change material perfect absorbers"



A. Tittl *et al.*, *Adv. Mater.* 27, 2497 (2016)

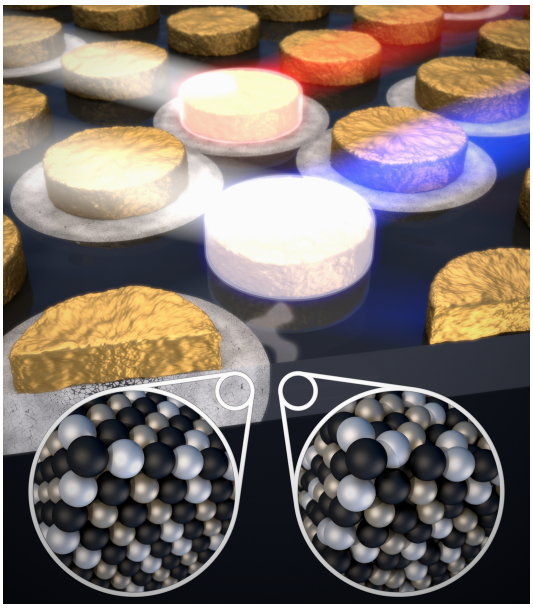
Motivation:

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 nanosecond laser pulses.

The resonances of **metallic infrared nanoantennas** covered with a PCM can therefore be shifted spectrally by simply changing the phase of the PCM. This concept is useful for several applications like tunable polarization filters and **perfect absorbers**.

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



By courtesy of Julian Barnett (2017)

Task:

The goal of the thesis is to **investigate perfect absorbers based on metallic nanostructures and phase-change materials.** The student will first simulate and model the perfect absorbers. 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 for reversible switching of the PCM (see left image) 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.

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