I. Physikalisches Institut (IA)
Physik neuer Materialien

RWTH AACHEN UNIVERSITY

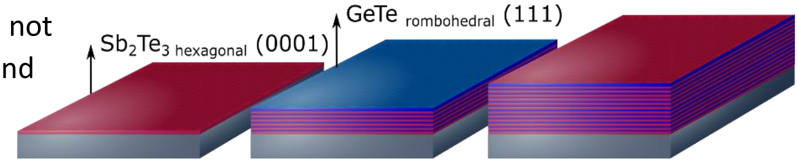
I. Institute Of Physics (IA)
Phase Change Materials
Prof. Dr. Matthias Wuttig

Masterthesis

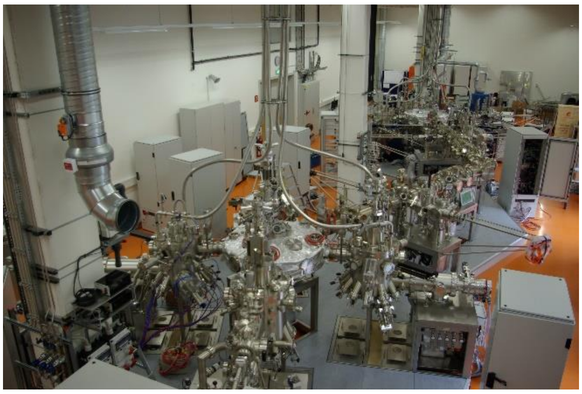
"Epitaxial Growth of Phase-Change Thin Films"

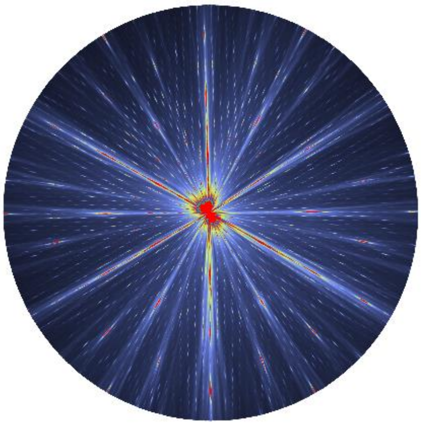
Phase-Change materials (PCMs) are classified as a group of materials, which can be easily crystallized or amorphised by heating or melt quenching, respectively. Another property of PCMs is the strong contrast of electrical conductivity and optical reflectivity. Thus, these materials are commonly employed for data storage in e.g. DVDs. However, they are not yet used in many solid state memory applications, although the change of electrical conductivity upon crystallization would make this possible.

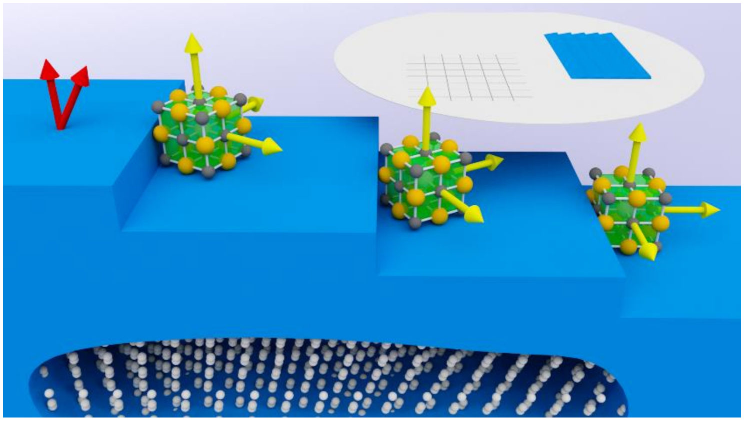
Recently, it has been found that the electrical switching properties of PCMs can be enhanced, if a heterostructure of two different PCMs is used, rather than a single alloy. This enhancement is assumed to rely on the fact that the heteostructures do not exhibit a transition between amorphous and crystalline phases, but rely on a rearrangement of atoms at the interfaces of the heterostructure.



Our group uses molecular beam epitaxy (MBE) to deposit such heterostructures. This method allows for the deposition of highly crystalline, and biaxially textured thin films. Also, since MBE is performed under ultra high vacuum conditions, it is possible to employ reflection high energy electron diffraction (RHEED) during the growth. With these in-situ measurements, it is possible to determine the crystal structure of even a few atomic layers thin films. Thus, we can observe phenomena, which occur only at these very early states of growth, where every next atomic plane can change the crystal structure significantly. Additional structural analysis (AFM, SEM, XRD, APT) is conducted in Aachen. Also some cooperations with other institutes allow for further analysis via e.g. transmission electron microscopy and angle resolved photoemission spectroscopy.







For further details or questions we would like to invite you to contact us via mail or phone.

Hetal Vaishnav
Vaishnav@physik.rwth-aachen.de
FZ Jülich 0241 / 61 6497