Universität Basel
Swiss Nanoscience Institute

PAUL SCHERRER INSTITUT
PSI

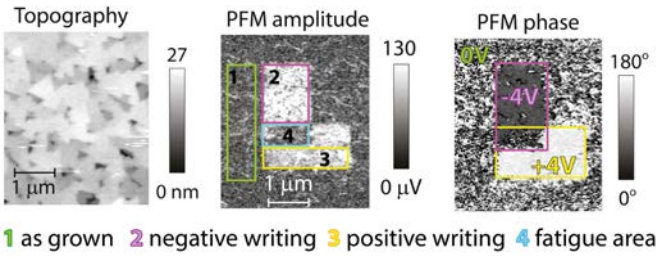
SNI SWISS NANOSCIENCE INSTITUTE
EINE INITIATIVE DER UNIVERSITÄT BASEL UND DES KANTONS AARGAU

Local manipulation of spin domains in a multiferroic Rashba semiconductor

Principle investigators: Matthias Muntwiler, Thomas A. Jung

Multiferroic Rashba semiconductors (MUFERS) are promising materials for future information technology since their magnetic, electric and elastic response to an applied external field are coupled. This property could be used, for example, to switch a spin-polarized current in a field-effect transistor by applying a gate voltage. The development of viable device prototypes, however, requires a detailed understanding of the structure and morphology of the surface [1].

In this project, the local electronic and magnetic structure of thin films of multiferroic $Mn_xGe_{1-x}Te$ shall be studied by scanning probe and photoelectron spectroscopy methods. In particular, the student will conduct experiments to polarize individual surface domains and read out their local spin density of states by spin-polarized scanning tunnelling microscopy and spectroscopy (SP-STM/STS) [2]. For a complementary view on the atomic and electronic structure, she/he will also carry out synchrotron-based photoelectron spectroscopy (ARPES) and diffraction (XPD) measurements.



Ferroelectric switching of GeTe measured by piezoforce microscopy (PFM). The topography image shows the morphology of the thin film with 1 µm wide grains. The PFM amplitude and phase images show contrast due to electric polarization after the indicated writing protocol [1].

The experimental work will be done at the Nanolab at the Universität Basel, the PEARL beamline [3] at the Paul Scherrer Institut and in collaboration with European partners.

We are looking for a highly motivated individual who enjoys working in a small team of scientists with different backgrounds. The candidate must have a master's degree in nanoscience, materials science, physics, physical chemistry or a related field. An interdisciplinary background is of advantage. Ideally, he/she has experience in one of the above mentioned methods and enjoys working with complex scientific instrumentation. Fluent English is essential, basic knowledge of German is desirable.

Further Information / Contact

Dr. Matthias Muntwiler, +41 (0)56 310 5138, matthias.muntwiler@psi.ch
Prof. Thomas Jung, +41 (0)56 310 4518, thomas.jung@psi.ch

[1] J. Krempaský, S. Muff, J. Minár, et al., Phys. Rev. X 8, 021067 (2018).
[2] R. Wiesendanger, Rev. Mod. Phys. 81, 1495 (2009).
[3] https://www.psi.ch/en/sls/pearl