



PhD Program between the Freie Universität Berlin (FUB) and the China Scholarship Council (CSC)

Open PhD Position at Freie Universität Berlin, offered only to Chinese CSC Scholarship Candidates 2019

Please Note: this PhD position is only offered to Chinese PhD candidates for the application in the framework of the FUB-CSC PhD Program.

<u>Department/Institute:</u>	Institute of Experimental Physics
<u>Subject Area:</u>	Surface Physics, Magnetism
<u>Name of Supervisor:</u>	Prof. Dr. Paul Fumagalli
<u>Number of Open PhD Positions:</u>	1
<u>Type of the PhD Study:</u>	Full-time (4 Years)
<u>Project Title:</u>	Steering of Magnetic Domain Walls (DW) in Nanostructured Magnetic Films.

PhD Project Description:

Prof. Dr Fumagalli's working group investigates thin films, layer systems and nanostructures prepared in a molecular beam epitaxy lab (MBE-lab) with surface-analytical methods (RHEED, SPA-LEED, AES, STM / AFM), scanning near-field optical microscopy (SNOM), magneto-optic spectroscopy (energy-, field- and temperature-dependent MOKE), and time-resolved MOKE.

One of our focus is to study the steering of magnetic domain walls (DWs) by single ultrashort laser pulses in magneto-optical switching media. Displacing magnetic DWs has moved into the centre of interest in the last years, driven by the prospect for potential applications such as racetrack memories [1,2]. Besides DW motion by magnetic fields and electric currents, laser-induced manipulation of magnetization is considered particularly interesting concerning speed and power consumption.

We propose to use different nanotriangle systems to study the influence of the magnetic properties of the system on the effect of directed DW motion in the lateral gradient of ultrashort laser pulses. Also, we are trying to understand the mechanism responsible for this motion. The growth mode of epitaxial thin films deposited by electron beam evaporation on Si (100) substrates can be studied. The surface topography and quality of the grown films will be investigated by scanning tunnelling microscopy (STM), atomic force microscopy (AFM) and spot-profile analysis low-energy electron diffraction (SPA-LEED).

The DW motion by laser-induced manipulation of magnetization will be studied with the help of magneto-optical Kerr effect. We expect to gain a detailed understanding of the unidirectional laser-induced DW motion.

[1] S. S. P. Parkin, M. Hayashi, and L. Thomas, Magnetic domain-wall racetrack memory, Science 320, 190 (2008).

[2] O. Sandig, Y. A. Shokr, J. Vogel, S. Valencia, F. Kronast, and W. Kuch, Movement of magnetic domain walls induced by single femtosecond laser pulses, Phys. Rev. B 94, 054414 (2016).

Language Requirements:

IELTS: 6,5 / TOEFL: 95 ibt

Academic Requirements:

- Master degree in physics.
- Knowledge of solid state physics.
- Knowledge in the field of magnetism and/or magneto-optics
- Experience in the field of ultra-high vacuum technology (UHV)
- Experience in dealing with molecular beam epitaxy (MBE)
- Knowledge of one or more of the following analytical methods:
(SPA) -LEED, AES, RHEED, STM, AFM

Information about the Professor or Research Group Leader:

<http://www.physik.fu-berlin.de/einrichtungen/ag/ag-fumagalli/index.html>

Please Note: In a first step, the complete application should be submitted to the Beijing Office for evaluation by January 4th, 2019. Please do not contact the professor before. He/she will get in contact with you after having received the complete application via the Beijing Office in January.