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.

Department/Institute:	Institute of Experimental Physics
Subject Area:	Surface Physics, Magnetism
Name of Supervisor:	Prof. Dr. Paul Fumagalli
Number of Open PhD Positions:	1
Type of the PhD Study:	Full-time (4 Years)
Project Title:	Magnetically Interacting in Ultrathin Multilayered

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 focuses is the investigation of magnetically interacting systems consisting of a combination of ferromagnetic metals and ferromagnetic semiconductors concerning spintronic applications. A persistent challenge in the field of spintronics is to find suitable materials that enable the circumvention of the impedance mismatch that prevents efficient spin-injection from metallic ferromagnetic conductors, e.g. Fe, into semiconductors such as GaAs. One class of such materials are the magnetic semiconductors like europium sulphide (EuS). EuS possesses a band gap of 1.6 eV and a magnetic moment of 7 μB per atom. It exhibits ferromagnetism below its Curie temperature (TC) of 16.5 K, which showed to increase up to room temperature (RT) in multilayer structures with 3d-metals such as Co and Ni making EuS a possible candidate for future spintronic applications [1]. From our studies we conclude that the TC enhancement effect is concentrated on the EuS/3d-metal interface. Thus, realizing epitaxial EuS films in such bi- and multilayer structures is a great interest. We aim to investigate and optimize the conditions required for high-quality growth of epitaxial EuS films on suitable substrates.

The growth mode of epitaxial EuS thin films deposited by electron beam evaporation on InAs(100) substrates will be studied with varying combinations of growth and annealing temperatures. 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 magnetic properties and TC of epitaxial EuS films and EuS/3d-metal bilayers will be measured by temperature-dependent MOKE.

[1] S. Pappas, P. Poulopoulos, B. Lewitz, A. Straub, A. Goschew, V. Kapaklis, F. Wilhelm, A. Rogalev und P. Fumagalli, Scientific Reports, vol. 3, p. 1333, 2013.

[2] P. Poulopoulos, A. Goschew, V. Kapaklis, M. Wolff, A. Delimitis, F. Wilhelm, A. Rogalev, S. D. Pappas, A. Straub and P. Fumagalli, Applied Physics Letters, vol 104, Nr. 11, p. 112411, 2014.

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.