PhD Position in Condensed Matter Physics

In the field of Experimental Nano-Magnetism and Magnetic Materials

Workplace: Department of Condensed Matter Physics, Faculty of Science, Masaryk University in Brno, Czech Republic

Thesis Topic: **Investigations of Nano-scaled Ferromagnetic Semiconducting Oxides for Spintronic Applications**

Supervisor: Hoa Hong Nguyen, PhD

Type of Cooperation: PhD fellowship (more information on PhD study programmes at the Faculty of Science here)

Expected Start Date: negotiable (approx. September 2021)

Application Deadline: 31 March 2021

About the Workplace

The PhD student will join our research activities in the Department of Condensed Matter Physics. Experiments will be performed using the unique equipment of CEITEC Nano Infrastructure, the national joint research infrastructure of the Central European Institute of Technology of Brno University of Technology and Masaryk University (see http://www.nano.ceitec.cz).

Masaryk University is the second-largest university in the Czech Republic with nine faculties, more than 5000 staff, and more than 30 000 students. As a comprehensive research-intensive university with a strong international standing, our mission is to pursue top-quality research and education.

Faculty of Science, a proud holder of the HR Excellence in Research Award by the European Commission, is a research-oriented faculty, offering university education (Bachelor's, Master's, and Doctoral degree programs) closely linked to both primary and applied research and high school teaching of the following sciences: Mathematics, Physics, Chemistry, Biology, and Earth sciences.

Supervisor

Dr. Hoa Hong Nguyen (Ph.D. from Japan Institute of Science and Technology, Habilitation at University of Tours) has a long and rich experience in research of Magnetism and Magnetic Materials, as well as supervising graduate students at the University of Leipzig, Germany; CNRS-University of Tours, France; and Seoul National University, South Korea.

Description

The aim of the study is to verify the role of oxygen vacancies and defects in introducing room temperature ferromagnetism in various pristine Semiconducting Oxides in nanoscale. By down scaling semiconducting oxides, under appropriate conditions that may create oxygen vacancies/defects, room temperature ferromagnets can be obtained. This may allow one to manipulate the spins and charges simultaneously in the same device. We propose to study the effect of introducing additional carriers and lattice defects on the ferromagnetic properties of thin

films of undoped oxides. The investigations will exploit the element selectivity of X-ray magnetic circular dichroism to detect changes in the spin polarization caused by the presence of extra charge carriers due either to x-ray irradiation or to dopant impurities. We expect these studies to shed new light on the mechanisms of d0-Ferromagnetism.

The PhD candidate is expected to join our research in one of the following research activities:

- Preparation of targets and ultrathin films of pristine TiO_2 and Ta- or C- doped TiO_2 with different dopant concentrations. Perform XRD, VSM or MPMS, XAS, XMCD, and other necessary measurements at different temperatures and fields to characterize the films.
- Preparation of targets and ultrathin films of undoped- SnO_2 and C-doped SnO_2 ultrathin films on different substrates grown under different annealing conditions. Perform necessary measurements such as XRD, VSM or MPMS, XAS, XMCD, etc. to characterize the films.
- Manipulating oxygen vacancies and defects in a controllable way by means of changing size, conditions, in-situ arrangements.
- Performing possible simulations to guide the experiments.

Offered Conditions

Besides, studying at our Faculty is an opportunity to study and live in a modern and dynamic city and one of 10 best student cities.

In addition to the standard PhD scholarship at Masaryk University (CZK 12 000 per month), additional funds are provided through departmental resources (assignment in research projects, additional scholarships). An overall monthly net income is at least CZK 23 000. Additional support includes performance-based bonuses (scholarships for successfully published papers) as well as support for international mobility or attendance of conferences etc.

Required Skills and Qualifications

- Master's degree in either Condensed Matter Physics or Chemistry of Solids
- Hands-on experience in experimental laboratories, being familiar with equipment in Physics and/or Chemistry Labs should be preferable.
- Good communication skills (oral and written) in English.
- High level of commitment to complete the PhD studies

How to Apply

Please send your curriculum vitae, cover letter with a concise summary of your previous research activities, and contacts of two persons who might provide references to: dr. Nguyen **hong.nguyen@mail.muni.cz**

Selection Process

Received applications will be continuously reviewed and carefully considered. Shortlisted applicants meeting the requirements will be invited to an interview.

Please note that your application does not substitute an official admission process to Ph.D. studies at SCI MUNI. Details including discussion about the research topic, required documentation or formalities will be a subject of the interview with successful candidates. Only upon the informal pre-agreement with potential future supervisor, a formal application for PhD studies at Faculty of Science, Masaryk University can be submitted.

We are looking forward to hearing from you!