

20 March 2024

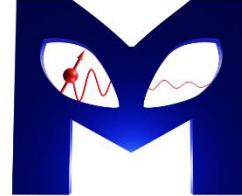
Doctoral contract offer



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MAGNETALLIEN

Subject : Harnessing spin-orbit coupling on epitaxial compounds

General information

Workplace: Nancy, FRANCE

Type of contract: PhD Student contract / Thesis offer

Contract period: 3 years

Expected date of employment : 1st October 2024

Proportion of work: Full time

Remuneration: 2135 € gross/monthly.

Desired level of education: Master in Physics

Experience required: Master

Description of the thesis topic

This study is part of the ERC CoG MAGNETALLIEN project which aims to probe AC detection of spin pumping signal and its high harmonics. The main responsibilities of the selected candidate are as follows: Growth of epitaxial compounds such as alpha-Sn, half Heusler topological insulator, and B20 compounds integrated with other layers. Carry out the micro/nano fabrication of devices based on previous systems and perform the electrical and magneto-transport characterizations. Evaluation of the spin-charge current interconversion rates efficiency by DC spin pumping, spin-torque ferromagnetic resonance, second harmonic and/or spin Seebeck effect techniques.

Work context

The student will work within the SPIN research group, Institute Jean Lamour, under the supervision of Dr. J.Carlos Rojas-Sánchez, Dr. Sébastien Petit-Watlot, and Dr. Stéphane Andrieu (for the growth part).

In addition to heavy metals with strong spin-orbit coupling (SOC), some 2D systems have strong conversion rates between charge current and pure spin current. Among these systems are the surfaces or interfaces of topological insulators which are new states of matter. The growth of these materials will allow us to develop new types of magnetic memory and other spintronic devices that will reduce energy consumption as well as new kind of devices to be exploited in spin-caloritronics (harvesting energy).

Within the framework of the ERC CoG MAGNETALLIEN project, we are seeking a highly motivated young student with a background in solid-state physics. We have a bunch of growth techniques such as Molecular Beam Epitaxy interconnected in ultra-high vacuum including in-situ ARPES characterization. The candidate will benefit from these facilities, as well as training and access to a clean room platform to pattern the devices. The project aims to harness SOC on epitaxial compounds either at interfaces, such as Topological Insulators or Weyl semimetals, or bulk SOC, such as B20 compounds, looking for optimization of spin-charge interconversion towards spin-orbit torque and AC spin pumping detection.

Skills Background in solid-state physics. Knowledge of spintronics and/or nanomagnetism is a plus. Programming in Python, Mathematica and/or LabVIEW will be considered a plus.

Constraints and risks

No major risk. The selected candidate will have to work in cleanroom environments.

About Institut Jean Lamour

The *Institut Jean Lamour* (IJL) is a joint research unit (UMR 7198) of CNRS and *Université de Lorraine*. Focused on materials and processes science and engineering, it covers: materials, metallurgy, plasmas, surfaces, nanomaterials and electronics. It regroups 183 researchers/lecturers, 91 engineers/technicians/administrative staff, 150 doctoral students and 25 post-doctoral fellows. Partnerships exist with 150 companies and our research groups collaborate with more than 30 countries throughout the world.

Its exceptional instrumental platforms are spread over 4 sites; the main one is located on Artem campus in Nancy.

The project will be carried out within the SPIN team whose subjects range from the development of innovative materials for implementation in spin electronics devices, to the development of magnetic sensors and the fundamental study of physical phenomena related to magnetism.

Application

Interested candidates should apply through the CNRS website attaching a CV, motivation letter, and names of two or more researchers whom we may eventually contact:

<https://emploi.cnrs.fr/Offres/Doctorant/UMR7198-MARTAI-099/Default.aspx?lang=EN>

Short-listed candidates will be contacted for an interview as we receive their applications.

Further information:

- J. Carlos Rojas-Sánchez (CNRS Researcher) : juan-carlos.rojas-sanchez@univ-lorraine.fr
- Sébastien Petit-Watelot (UL Enseignant chercheur) : sebastien.petit@univ-lorraine.fr
- Stéphane Andrieu (UL Professor) : stephane.andrieu@univ-lorraine.fr



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