

Tenured Position at CNRS – to Join the Spintronic and Nanomagnetism group at IJL

## **Growth of Model Heterostructure for the next generation of Spintronic devices**

The CNRS recruits permanent research positions (*Chargé de Recherche*) through competitive examination at France national level, with no pre-allocation to an Institute or a University. See <https://carrieres.cnrs.fr/en/external-competitions> . The SPIN team @ IJL <https://spin.ijl.cnrs.fr> will help you in the application and be very happy to welcome you in his team

### **Description of the host Group:**

Observing, manipulating and functionalizing the magnetism of matter at nanometric scales is at the core of the Spintronics and Nanomagnetism group's research.

The objectives are to understand and control the structural, electronic, magnetic and transport properties of magnetic nanostructures of different dimensions (2D: thin films, interfaces, super-networks; 1D: thread, tracks and 0D: pillars, aggregates) and at different time scale from seconds to femto-seconds

The research activity is both fundamental and experimental. The group has the means and know-how to develop model systems. The structural, magnetic and electrical characterization of these systems are taken into account at different scales. Furthermore, their evolution under the influence of different stimuli (magnetic fields, electric fields, temperature, electric currents, stress, laser pulses) is considered.

The group members are particularly involved in various endeavors beyond the group's perimeter:

- The TUBE Davm competence center. This tool is unique in the world : <https://ijl.univ-lorraine.fr/en/research/competence-centers/deposit-and-analysis-of-nanomaterials-under-ultra-high-vacuum-daum/>

- The Minalor center for micro and nanofabrication: A Clean room for UV and e-beam lithography and patterning

- The magnetism center : <https://ijl.univ-lorraine.fr/en/research/competence-centers/magnetism/>

The team is recognized for the very high level of its fundamental research. Every year, it develops numerous fruitful collaborations with the best spintronic and nanomagnetism laboratories in the world.

### **Description of the activity:**

The researcher will work mainly within the Davm Competence Center a technological platform made up of more than 30 interconnected ultra-high vacuum systems, combining in-situ growth and characterization of nanomaterials. He will become the scientific manager of one or more growth chamber (Molecular Beam Epitaxy (MBE), and / or Sputtering and / or Atomic Layer Deposition (ALD) and in-situ characterization: Near field microscopy (STM, AFM) insitu Kerr and Faraday measurement under magnetic field as well as in situ Auger, XPS, ARPES.

The new researcher will be responsible for developing model thin films and heterostructures to study new magnetism/spintronic-related phenomena. The new researcher will become the scientific in charge of several UHV chambers on the TUBE Davm.

The researcher will develop the growth of low-dimensional materials in the framework of the cutting edge activities developed in the Spintronics and Nanomagnetism team.

For example, we can underline the expected emergence of systems based on magnetic oxides for themes related to interface electronic transport, Spin Orbit Torque effects, ultra-fast magnetization dynamics in spintronic devices or even the emergence of new functionalities (ferroelectricity, multiferroicity, etc.). The oxides of transition metals, in particular the compounds of perovskite structure (ABO<sub>3</sub>), have here a strong potential to combine / couple several functionalities or to bring out new ones, by the strong electronic correlations and the interactions between the different degrees of freedom of the electron and the crystal lattice.

The development of topics at the interface between superconductivity, spintronics and ultra-fast dynamics will also require ultimate control of the superconductor / magnetic metal interfaces. Nevertheless, the growth of metallic architectures will remain central, with the synthesis of high-quality crystal systems for the emergence of specific electronic and magnetic properties. In particular for the design of model antiferromagnetic systems, stacks allowing the coupling of complementary properties, of complex alloys with semi-metallic properties (Heusler), of topological insulators which are intended to be inserted into SOT devices.

#### **Education, Experience, Knowledge and Competences required:**

Education: PhD in Physics, Material Science or Engineering. Post-doc experience will be highly valued

Knowledge: Condensed Matter Physics, Nanomagnetism and Spintronic. Experience in Ultra-high vacuum technics for sample growth such as MBE, Sputtering, ALD, PLD growth and insitu characterization as STM, AFM, XPS and ARPES are expected

An establish track record of successful research project management are mandatory.

The applicant must show strong interest for teamwork, motivation, excellent disposition towards challenging problems, a good level of English to be at ease to interact in an international environment.

#### **How to apply:**

All applicants should contact the Head of the SPIN team (Stéphane Mangin : [stephane.mangin@univ-lorraine.fr](mailto:stephane.mangin@univ-lorraine.fr)) and send a full CV including contact details. We will then organise hearing ( 45 minutes seminars followed by questions) to select the candidate supported by the team to apply for the CNRS researcher position