Employment type **Post-Doctoral position** (**ANR IOBO** – *In operando* investigation of barium titanate based oxide multiferroic nanostructures)

Research context The IOBTO project proposes a fundamental approach to the *in operando* study of technologically relevant, artificial multiferroic oxide structures, using advanced characterization methods available in laboratories or at synchrotron facilities. We consider and elaborate fully epitaxial layers and nanostructures of ferromagnetic oxides – at the interface of – or embedded in ferroelectric barium titanate ($BaTiO_3$) layers. Such single crystalline structures can be considered as model systems for the investigation of the coupling between (ferro-)magnetic and ferroelectric properties while being relevant from an application point of view (addressable memories). In particular, we want to analyze the coupling of domains and domain walls under operation in static and dynamic electrical excitation.

Research mission Several types of samples are already available based on $MFe_2O_4/BaTiO_3$ layers (M=Co, Ni,...) grown by atomic oxygen molecular beam epitaxy (AO-MBE); this set of samples may be completed if needed. A separate work implying other ferromagnetic oxides of perovskite type, grown by pulsed laser deposition (PLD), is planned in parallel. The films may consist in multilayers (the stacking of ferromagnetic layers on ferroelectric ones) or be composite. Several tracks are followed concerning the composite films: lithography and/or annealing process.

The detailed knowledge of the structural, chemical, magnetic and electrical/ferroelectric properties of any nanostructured film will be the primary task of the candidate, as the prerequisite to any further *in operando* investigation of the magneto-electric coupling. The coupling, which concerns magnetic changes under applied electrical voltage as well as ferroelectric changes under applied magnetic field, will be studied for the more relevant samples. It has to be clarified how the magnetic and electric domain structures and domain walls coexist and interact. Depending on the profile of the candidate, different characterization techniques will be used including: X-ray diffraction, electron microscopy, atomic force microscopy with derived PFM/MFM modes, current-voltage and polarization-voltage measurements, magnetometry and ferromagnetic resonance, magnetic dichroism (XMCD/XLD)… The candidate will be responsible for carrying out some of the experiments while being able to work with contributors to the project.

Competences The position requires a Ph.D in condensed matter physics and the demonstration of implication in work. The candidate must have an experience in some of the techniques listed above. A background in instrument development, cryogeny, lithography would be appreciated. The project requires rigor, organization and ability to work both independently and with different partners. Good oral and/or written communication skills in English are important.

Working place ***Mainly :*** **INSP** (Institut des NanoSciences de Paris, UPMC, 4 Place Jussieu, 75005 Paris)
From time to time : **CEA** (centre CEA Paris-Saclay, 91191 Gif-sur-Yvette cedex) &
SOLEIL (synchrotron SOLEIL, L'Orme des Merisiers, 91190 Saint-Aubin)

Mission duration : 12 months

Contact : Nathalie Jedrecy (Professeur UPMC-Sorbonne Universités) jedrecy@insp.jussieu.fr

The candidate should demonstrate the adequacy of his/her profile with the mission. The folder will include a cover letter, a CV, a summary of the thesis/post-doc research with a list of publications, a recommendation letter.