PhD Position: 2D Perovskite Oxide Membranes

Passionate about nanotechnology and unravelling new physics? Join us! We are looking for an experimental PhD student to study the fundamental properties of quasi 2D perovskite oxide membranes for neuromorphic computing.

Context:

Perovskite oxides offer a rich and unique property portfolio such as ferro/piezo/pyroelectricity, ferromagnetism, etc., placing them among the most attractive and exciting materials for next-generation electronics, photonics and quantum devices [1]. However, their integration in conventional semiconductor devices remains a major challenge due to the different crystalline structure and lattice constants.

While flexible and wearable electronics are currently among the fastest growing markets worldwide, perovskite oxides *thin films* deposited directly on flexible substrates suffer from poor crystallinity with a maximum bending strain well below 1%. Recently, a promising solution has emerged by using freestanding, crystalline membranes instead. Such membranes are free from constraints of the growth substrate and are compatible with both conventional and flexible substrates. Reducing the dimensionality, modifying their boundary conditions, suppressing the constraints from the growth substrate, and assembling stacks, opens up a new playground to create new combinations of materials, with different dimensionality and functionality. In heterostacks, i.e. artificially assembled stacks of membranes, the interaction between the layers gives rise to new physical phenomena, such as moiré patterns or chirality [2].

References:

[1] D. Pesquera et al., Freestanding complex oxide membranes, Journal of Physics: Condensed Matter 34, 383001 (2022).
[2] G. Sánchez-Santolino et al., A 2D ferroelectric vortex pattern in twisted $BaTiO_3$ freestanding layers, Nature 626, 529 (2024).

Project description:

For this PhD thesis, you will work on ferroelectric perovskite oxide membranes such as $BaTiO_3$ (BTO) and rare earth nickelates, which exhibit an insulator-metal transition. We will investigate new strategies to drive and control transitions in nickelates by applying strain and explore new degrees of freedom to tune the membranes' properties by e.g. controlling ferroelectric domain sizes via thickness reduction and twist angle. While the core of your work will focus on the fundamental properties of perovskite membranes and novel physical phenomena arising from the interaction between the layers, the ultimate goal is to exploit these new properties for neuromorphic computing devices.

Figure 1: Raman map on BTO layers obtained from principal component analysis.

Your tasks will involve the material growth (pulsed laser deposition, RF sputtering), the fabrication of membranes and their characterisation. You will use advanced optical characterisation techniques such as Raman spectroscopy, scattering scanning near field optical microscopy, as well as atomic force microscopy as function of temperature, strain and electric field. As PhD candidate you will develop expertise in sample preparation, cutting-edge optical and surface probe characterisation techniques, device fabrication and characterisation. Statistical methods such as principal component analysis will be used to analyse and interpret the data, (Fig. 1). As part of the PhD programme, a research visit to our collaborators in Spain is foreseen, offering opportunities for international networking.
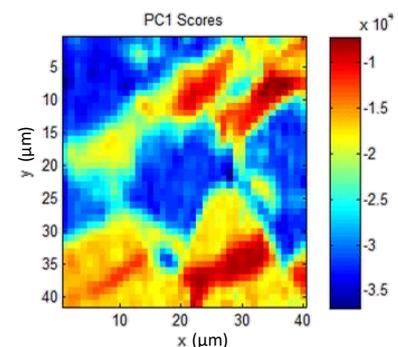
Location, salary, dates:

As PhD student you will be working on the three different sites of the GREMAN laboratory (UMR CNRS): CERTeM (a microelectronics research centre) in Tours, the Faculty of Science and Technology of the University of Tours (Parc Grandmont, 37200 Tours) and the IUT (rue de la Chocolaterie, 41029 Blois). You will be enrolled as PhD student at the doctoral training school of the University of Tours, where you can benefit from a tailored training programme to acquire transferable, discipline-related and research skills. The following video will introduce you the University of Tours.

The GREMAN laboratory has strong expertise in ferroelectric oxides (from their growth to device integration, including their complete characterisation). You will have access to state-of-the-art facilities, laboratories and equipment including vast cleanroom facilities.

This PhD position is part of the ANR JCJC project *PerOMem*. In this context, the doctoral student will join a vibrant international team. You will have the opportunity to contribute to an interdisciplinary team of physicists, materials scientists, engineers and chemists. The environment is open and collaborative, promoting daily interaction and knowledge exchange.

The starting date of the **3-years** PhD position is **01 October 2026**. It is a fixed term contract (36 months) with a gross monthly salary of ~2,300.00 €.

Candidate profile:

The candidate should have a master's degree in Physics, Materials Sciences, Engineering or Chemistry. They must be motivated and dynamic with strong abilities in experimental work. A good command of the English language is required, both written and oral (at least B2 level). Internship experience in a research laboratory will be strongly appreciated. Experience in 2D materials and/or ferroelectric materials would be a plus.

How to apply:

Prospective candidates should send their **detailed CV**, a **cover letter** and the contact details of **at least one reference** by email no later than **31/03/2026** to the three thesis supervisors:

Anna Ott: anna.ott<at>univ-tours.fr

Vinh Ta-Phuoc: vinh.ta-phuoc<at>univ-tours.fr

Kevin Nadaud: kevin.nadaud<at>univ-tours.fr

The most promising candidates will be invited for an interview.