Ph.D. position: Lead-Free Ferroelectric Oxide Thin Films by Sputtering

Keywords: Thin films, sputtering, ferroelectricity, microelectronics

Are you passionate about advanced materials and sustainable technologies? Join our team to explore eco-friendly alternatives to lead-based compounds in piezoelectric materials! This PhD project aims to develop lead-free ferroelectric oxide thin films, optimizing their performance while ensuring environmental sustainability.

Context and Objectives:

Piezoelectric materials are at the core of numerous modern applications, from ultrasonic sensors to nanogenerators and telecommunications. However, while lead-based compounds offer excellent performance, they pose significant environmental hazards. Our mission is to identify lead-free alternatives with properties comparable to lead zirconate titanate (PZT). When structured as thin films, these alternative materials exhibit unique behaviors influenced by composition, crystalline structure, morphology, and internal stresses. Mastering deposition conditions is thus crucial to enhancing ferroelectric properties and facilitating the integration of these materials into future electronic devices.

Research Environment and Methods:

You will join the GREMAN laboratory (http://greman.univ-tours.fr/) in Tours-Blois, working at the Blois materials synthesis hub. You will have access to a multi-target RF magnetron sputtering system, allowing you to explore new deposition conditions. The research program will be supported by an expert team and equipments for film characterization, including:

- Structural analyses: XRD, Raman/IR spectroscopy, FEG-SEM, AFM.
- Chemical and physical characterizations: EDX, dielectric and ferroelectric measurements.

You will collaborate with CERTeM (http://certem.univ-tours.fr/), the microelectronics hub, to characterize the electrical properties of thin films, particularly through the fabrication of Metal-Insulator-Metal (MIM) capacitors.

Your Mission:

- Conduct a comprehensive literature review to identify the most promising lead-free alternatives to PZT.
- Optimize deposition processes and define the best configurations for substrates and machine parameters.
- Perform detailed analyses of the chemical, structural, and electrical properties of the thin films.
- Develop devices for measuring ferroelectric and piezoelectric properties.

Candidate Profile:

We are looking for a passionate candidate with:

- A Master's degree or engineering diploma in Physics, Chemistry, or Materials Science.
- A strong interest in experimentation and hands-on experience with thin films (through internships or projects).
- Good English skills (written and spoken) and proficiency in scientific writing.
- A keen interest in research, innovation, and teamwork.
- Previous experience in deposition processes or thin film characterization.

Application Process:

Applications must be submitted via the doctoral school's website https://www.adum.fr/, following the specified guidelines. In parallel, the complete application file must be sent to the following address: meriem.chettab@univ-tours.fr

Recruitment will take place in two stages:

1. Pre-selection based on application (Deadline: **March 30, 2025**): https://www.adum.fr/ including:
    - CV and cover letter (1 page each).
    - Transcripts (Bachelor's and Master's).
    - Summary of previous internships.
    - Recommendation letter from your Master's internship supervisor.
    - Any other relevant information.
2. Interviews for shortlisted candidates: Selected applicants will be interviewed by a jury from the EMSTU doctoral school at the University of Tours between May 5-7, 2025. Further details will be provided later

Additional Information:

3-year PhD contract, starting October 1, 2025. Possibility of additional teaching activities.

Ready to take on this exciting challenge? Join us and contribute to sustainable technological innovation!

Contact Meriem Chettab, : meriem.chettab@univ-tours.fr, : 0254552101

Online application https://www.adum.fr/