2014-2015

Internship proposal (Master or final project engineering school) at LMGP Lab.

Perovskite-related Oxides as Resistive Switching (RS) Memories: Optimization of the chemical deposition parameters and control of the RS properties

Context:

Recently, **resistive random access memories (ReRAM)** constructed from oxide thin films have generated significant interest both in industry and in the scientific community for their use as non-volatile memory beyond Flash memory scaling. ReRAMs are considered one of the most promising emerging **non-volatile memories** due to high speed, high density, great scalability and low power consumption. These devices can store and process information and offer several key performance characteristics that exceed conventional integrated circuit technology. A RS memory cell (or "Memristor"=Memory+Resistor) is generally built by a MIM (metal-insulator-metal) structure, composed of an oxide material sandwiched between two (possibly different) electron conducting metal electrodes[1]. In these MIM switches the resistance of the oxide material changes under the influence of an acting electric field or current. This process is reversible and non-volatile, meaning that it remains in its previous resistive state even with zero bias applied.

Objectives:

The Master student will focus on the investigation of **perovskite-related oxides** grown by **Metal Organic Chemical Vapor Deposition**. The main objective of this internship is to deposit and perform the complete characterization of oxide films from the $La_2NiO_{4+\delta}$ family in order to evaluate its suitability as memristor materials. For understanding the fundamental mechanisms which underlie the RS, it is mandatory to determine the physico-chemical processes taking place and to relate structural, micro-structural, chemical parameters to the electrical performance. The LMGP houses state of the art experimental equipment for investigating such properties. X-ray diffraction, atomic force microscopy,, electron microscopy(SEM, TEM) and in-situ Raman spectroscopy will be routinely used and will be combined with electrical measurements to get a better understanding of the relationships between microstructure and RS properties for as-deposited and thermally treated thin films.

The **tuning and optimization of the chemical deposition parameters** will be used as the main tool to modify the physico-chemical, structural and microstructural properties to obtain the optimal memristive response. Finally the integration of these layers into simple devices might also be considered.

Scientific environment:

The candidate will work within the LMGP, Materials and Physical Engineering Laboratory, in the FM2N group. Located in the heart of an exceptional scientific environment, the LMGP offers the applicant a rewarding place to work.
LMGP Web Site: http://www.lmgp.grenoble-inp.fr/

Profile & requested skills:

We are looking for a highly-motivated student with a strong interest in experimental physics and materials science. Interpersonal skills, dynamism, rigor and teamwork abilities will be appreciated. Candidates should be fluent in English and/or in French. In addition, well-written English will be highly appreciated.

Subject could be continued with a PhD thesis: Yes

Allowance: Internship allowance will be provided

CONTACT

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1. Waser, R. Redox-Based Resistive Switching Memories. *J. Nanosci. Nanotechnol.* **12,** 7628–7640 (2012).