Spécialité : / CHIMIE

Laboratoire : /SPEC/LNO

Caractérisation electronique de l'interface spintronique (La,Sr)MnO3/SrTiO3

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Stage pouvant se prolonger en thèse : Oui
Durée du stage : 6 mois

Résumé:
Le but du stage est de réaliser une étude du transport électronique à travers la jonctions tunnel composée de LSMO dans le but de mieux comprendre le rôle de l'interface électrode/barrière dans les propriétés de transport dépendante du spin dans ces dispositifs.

Sujet :
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Electronic characterization of the (La,Sr)MnO3/SrTiO3 spintronic interface

Abstract:
The aim of the internship is to lead a comprehensive study of electronic transport through manganite-based tunnel junctions in order to better understand the role of the electrode/barrier interface on the spin-dependent transport properties of these devices.

Subject :
The control of functional properties such as spin-dependent transport is a crucial goal in spintronics. The unique properties of oxide thin films and their heterostructures make them very attractive for achieving this goal. For instance, magnetic tunnel junctions (MTJ) based on the mixed-valence manganite La2/3Sr1/3MnO3 (LSMO) exhibit very high tunnel magneto-resistance (TMR) ratios due to the half-metallic character of LSMO, with record TMR values reported for LSMO / SrTiO3 (STO) / LSMO junctions. However, open questions remain on the reproducibility of large TMR ratios, the type of transport and the link between properties and defects, interface and barrier quality. The landscape of the LSMO density of states (DOS), its dependence versus electric field, the chemical roughness at the interface with the STO barrier, are ill-known factors which can all affect the TMR and that will be investigated during this internship.

LSMO-based MTJ were fabricated and the chemical and electronic profiles of the LSMO/STO interface were characterized in operando, i.e. under an applied voltage using Hard X-ray PhotoEmission Spectroscopy (HAXPES) at the SOLEIL synchrotron (GALAXIES beamline). A systematic study of the electronic transport through the same junctions will be performed during the internship to complement the HAXPES results and thus consolidate the physical understanding of these devices. A study of the electronic noise could also be done to study the intrinsic transport in the structures. Other phenomena appearing under high electric field, such as oxygen vacancy migration and Mn valence state change will also be studied.

The ultimate goal of this project between CEA-SPEC and C2N is to design, fabricate and test new magnetic junctions with optimized properties for sensing applications.