

Spécialité de Master « Optique, Matière, Paris »

Stage de recherche (4 mois minimum, à partir de début mars)

Proposition de stage

Date de la proposition : 02/10/2018

Responsable du stage / internship supervisor:			
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Nom du Laboratoire / laboratory name:			
Code d'identification :	Organisme : SYNCHROTRON SOLEIL		
Site Internet / web site:	https://www.synchrotron-soleil.fr/en/beamlines/cassiopee		
Adresse / address:	Saint- Aubin L'orme des Merisiers. 91192 Gif-sur-Yvette CEDEX		
Lieu du stage / internship place:	CASSIOPEE BEAMLIN		

Titre du stage / internship title: Ferroelectric control of spin-orbit coupling in transition metal dichalcogenides
<u>Background</u> <p>With charge-based electronics getting to their limits in storage density, speed and energy consumption, spin-based electronics (spintronics) is now a central research topic and promises significant improvements in device performances. Controlling spins with an electric field is a major goal in spintronics since it is a low-energy-consumption handle to act on an elusive, fundamental property of matter.</p> <p>Taking advantage of the predicted giant Rashba effect at their interfaces, transition metal dichalcogenides (TMDCs) monolayers gated by a ferroelectric oxide layer can achieve this goal. By combining advanced angle- and spin-resolved photoemission spectroscopy, the long-term project behind this internship aims at a thorough characterization of the spin-split bands of TMDCs deposited on ferroelectric ultrathin films via molecular beam epitaxy or chemical transfer. By focusing on strong spin-orbit-coupled materials and hybrid interfaces, this project falls within the more general field of Quantum Materials, a fascinating venue to uncover the roles of symmetry, topology, dimensionality and strong correlations in macroscopic observables.</p>
<u>Scientific Project</u> <p>The goal of the internship is to control the ferroelectric polarization at the interface with the TMDC, in a way compatible with high resolution photoemission spectroscopy experiments. The internship adviser and his collaborators showed their ability to fabricate TMDCs on the one hand and oxide thin films on the other. They have performed some preliminary experiments showing the feasibility of WS₂ transfer on BaTiO₃ thin films and measured rough WS₂ band structure with minimal surface preparation.</p> <p>The intern will develop a reproducible, efficient method to clean in ultra-high vacuum (UHV) the TMDC/ferroelectric interface. In close collaboration with the film growers (C2N Orsay), she or he will monitor the evolution of the ferroelectric and electric properties as a function of annealing time and temperature. Ultimately, the electronic structure of clean samples will be fully characterized using the angle-resolved photoemission spectroscopy (ARPES) setup of Cassiopée beamline (one week of in-house beamtime is guaranteed). An outstanding achievement would consist in the control of the ferroelectric polarization in UHV. This internship is the first step of a possible PhD thesis on this subject in the framework of the ANR JCJC project CORNFLAKE.</p>
<u>Skills developed during the internship</u> <p>Knowledge on ferroelectric oxides and TMDCs. Hands-on knowledge on surface and interface preparation. First experience in ARPES on a synchrotron light facility (1 week of beamtime is guaranteed).</p>

Ce stage pourra-t-il se prolonger en thèse ? Possibility of a PhD ? : YES	
Si oui, financement de thèse envisagé/ financial support for the PhD: YES (funded ANR)	
Lumière, Matière, Interactions	Lasers, Optique, Matière

Fiche à transmettre (fichier pdf **obligatoirement**) sur le site <http://stages.master-omp.fr>