PHD STUDENTSHIP IN SEMICONDUCTOR SPIN PHYSICS IN TOULOUSE & STRASBOURG

Ultra-fast optical spectroscopy of ZnO nanostructures for spin-optoelectronic applications

The Quantum Opto-Electronics group of Toulouse University and the Ultrafast and Nanophotonics group of IPCMS Strasbourg is looking for a motivated PhD student with a strong interest in experimental physics. The suitable candidate will have the opportunity to work in the fast-evolving field of semiconductor spintronics and will benefit from state-of-the -art spectroscopic set-ups and a stimulating international environment.

Spin-based technology is viewed as a promising field on the "beyond-CMOS" roadmap as it offers a possible solution to reduce the heat of Information Technology devices as their dimensions shrink. Exploiting the spin instead of, or in addition to, the charge of electrons, could lead towards new multifunctional devices offering non-volatility, higher processing speeds, higher packing densities and reduced power consumption. There is currently a worldwide effort to integrate semiconductors and magnetic materials, as, at the very fundamental level, an efficient spin injection and detection of spin in semiconductors is essential to the field of spintronics. However, many unresolved issues remain. The research project "SPINOXIDE", just funded by the French National Research Agency, aims at contributing to this field by taking advantage of the ZnO compatibility with highly spin-polarized oxide ferromagnets to reach long spin diffusion lengths and spin lifetimes in ZnO. This project combines the complementary expertise of 4 French laboratories on epitaxial growth, ferromagnetic oxides, advanced structural studies and spin physics.

The proposed Ph.D. project aims at investigating and improving of the spin properties of ZnO at room temperature and to capitalize on these results to demonstrate a prototype of a ZnO-based spin-photodetector and spin-photoemitter. The analysis and control of the spin properties in semiconductors is at the heart of this research. The candidate will implement experimental works based on ultra-fast, polarization-resolved photoluminescence and Kerr-effect experiments both in the Quantum Optoelectronics group in the LPCNO Lab in Toulouse and in the Ultrafast and Nanophotonic group of the IPCMS Strasbourg.

This Ph.D. thesis is well suited for a student interested on both the experimental side (ultra-fast spectroscopy, frequency doubling/tripling, streak camera, confocal microscopy) and on the theoretical character (solid state physics, quantum mechanics, spin physics) of our research.

If you are interested in working with us on this project, please contact:

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Key words: optical spectroscopy, spin physics, nanostructures, wide-gap semiconductors.
Starting date: September 2021 at the latest
Qualifications necessary: Master's degree in physics
Language: The working language in our international group is English. Fluency in French is helpful but not required. The thesis can be written in English.

Laboratoire de Physique & Chimie des Nano-Objets

IPCMS Institut de Physique et Chimie des Matériaux de Strasbourg

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