LMGP
Laboratoire des matériaux et du génie physique
une vision des matériaux

2019-2020

Internship proposal at LMGP Lab.

Advanced Structural Characterization of ZnO Nanowires for Solar Cells and LEDs

Abstract

Semiconducting materials in the form of nanowires are considered as promising building blocks for the fabrication of innovative devices, including solar cells and light emitting diodes (LEDs). These nanowires typically exhibit a diameter in the range of several tens of nanometers and a micrometer length. Thanks to their geometry, they have a high crystalline quality and benefit from remarkable physical properties related to their surface over volume ratio, such as electronic confinement, mechanical stress relaxation or light trapping. As a biocompatible and abundant material, zinc oxide (ZnO) has numerous assets and can be grown in the form of nanowires by a large number of low cost and easily implemented deposition techniques. Owing to its wurtzite crystalline structure, ZnO nanowires grow along the polar and piezoelectric *c*-axis. Vertically aligned ZnO nanowire arrays and the related core-shell heterostructures have received a strong interest in the field of optoelectronics, including next-generation solar cells and LEDs.

Project description

The Master student will focus on the advanced structural characterisation of spontaneously grown and well-ordered ZnO nanowire arrays with controllable structural uniformity in terms of dimensions (i.e. diameter, length, density, period) obtained by low-cost chemical deposition techniques in combination with technological cleanroom processes. The related core-shell heterostructures will be investigated as well. The objective is to deeply investigate and optimize the physical and interface properties of the ZnO nanowire arrays using advanced structural characterisation techniques, such as Transmission and scanning Electron Microscopy in various modes (TEM), X-ray and electron diffraction, Energy Dispersive X-ray Spectroscopy (EDS) and Raman spectroscopy. A special attention will be given in the quantitative analysis of the obtained high resolution TEM images and EDS spectra. The Master student will work in close collaboration with a PhD student responsible for the development of the spontaneously grown and well-ordered ZnO nanowire arrays on different types of substrates.

Scientific environment:

The candidate will work within the LMGP, Materials and Physical Engineering Laboratory, in the NanoMat team in collaboration with Institut Néel (NEEL, team Semiconducteur à Grand Gap).
Located in the heart of an exceptional scientific environment, LMGP offers the applicant a rewarding place to work.
LMGP Web Site: http://www.lmgp.grenoble-inp.fr/

Profile & requested skills:

The applicant should be a highly-motivated Engineering School or M1 Master student with a strong background in materials physics and chemistry, nanosciences, and/or semiconductor physics. Specific skills regarding team work and English abilities will be required for her/his integration into the team and for taking part in the ongoing international collaborations.

Allowance: Internship allowance will be provided

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