Research Grants for PhD students from the China Scholarship Council

Information Form (please read the guidelines carefully on the website www-csc.utt.fr)

Supervisor's name : BREMOND Given names : Georges

Status (prof., assistant prof., …) : Professor

Laboratory :	INL - Institute of Nanotechnology of Lyon	Website address : http://www.inl.cnrs.fr
Institution :	INSA Lyon	Website address : http://www.insa-lyon.fr/fr

Scientific competence of the supervisor:

Expert in electronics and optoelectronics materials and devices - InP, GaAs, ZnO, GaN and related materials wide band gap– Solid state physics –Semiconductor and surface physics – Expert in scanning probe microscopy for electrical property analysis, optical (PL, FTIR, OA) and electrical (I-V, C-V admittance, capacitance, DLTS-DLOS) spectroscopies on semiconductor nanostructures, quantum dots, nanowires, material and device characterization.He has recently successfully developed scanning capacitance microscopy and spectroscopy (SCM-SCS), scanning spreading resistance microscopy (SSRM) and conductive AFM (CAFM) on ZnO nanowires.

Two major publications in the field proposed for the PhD :

1. L. Wang, C. Sartel, S. Hassani, V. Sallet, G. Bremond, Appl. Phys. Lett., 2018,113, 222103,doi/ 10 .1063/1.5054685- Resolving ZnO-based coaxial core-multishell heterostructure by electrical scanning probe
2. L. Wang,V.Sallet, C.Sartel, G.Brémond; Appl. Phys. Lett. 2016,109, 092101 ; doi/10.1063/1.4962046"Cross -section imaging and p-type doping assessment of ZnO/ZnO:Sb core-shell nanowires by SCM and SSRM.

Website address of the personal page : http://www.inl.cnrs.fr

Supervisor's email : georges.bremond@insa-lyon.fr

Description of the research work proposed for a PhD ***Topic # (see list) :*** IV-1

Title : Studies of electronic properties of wide band gap semiconductor related materials and nanowires by space charge techniques coupled with electrical mode scanning probe microscopy.

Subject :

The III-N semiconductor (nitrides) reach a real maturity in growth control and shown very exciting electronic and optoelectronic properties. In addition the use of nanowires (1D) allows to solve some problems associated with two dimensional (2D) due to strain relaxation in 2D layers at the origin of structural defects, electrical doping and light extraction. It is expected a considerable improvement of performances in the optoelectronic field of lighting and photovoltaic, two major domains for decreasing world energy consumption and producing “green electricity”. These nanowire structures need new analysis methodologies to control their electronic properties. We propose to contribute to understand the properties of wide band gap nanowires by developing electrical characterization techniques based on space charge zone analysis. G. Bremond has strong competences of this approach including electrical spectroscopy called deep level transient spectroscopy (DLTS-DLOS) based on capacitance and current transient analysis on Schottky barriers and p/n junctions. His team develops original nanoscale electrical measures based on atomic force microscopy (AFM) using conductive AFM tip (SCM-scanning capacitance microscopy, SSRM-spreading resistance) on quantum dots and more recently on nanowires. One of the main objectives of this thesis is to extend space charge measurement on 1 D nanowires for a better control of their electronic properties.

Keywords :

Group-III nitride semiconductor; heterostructure; optoelectronic;space charge technique; trap, defect, DLTS; DLOS; spectroscopy; capacitance; conductance; nanowire;AFM; SCM; SSRM; KPFM

Expected collaborations :

CNRS laboratories: Institut Pascal at Clermont Ferrand University,CHREA at CNRS Sophia-Antipolis; GEMAC at Versailles University;

Background required from the applicant :

High general educational level in physics, mainly in solid-state and surface physics and in physics of semiconductors. Good training in measurement techniques and instrumentation during intership training- Electronic skills in signal processing are appreciated.Training in atomic force microscopy instrumentation and in semiconductor physics and technology processes will be wellcome.

Existence of a PDF file detailing the proposal ("yes" or "no") : Yes

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