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 : BLUET Given names : Jean-Marie

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 based on SiC, GaN and related materials wide band gap– Solid state physics –Semiconductor and surface physics – Expert in optical (PL, Raman, FTIR) and electrical (I-V, C-V, admittance , capacitance, DLTS, DLOS) spectroscopies on semiconductor nanostructures, material and device characterization.

Two major publications in the field proposed for the PhD :

1. R. Khelifi,H. Mazari,S. Mansouri,Z. Benamara,M. Mostefaoui,K. Ameur,N. Benseddik,P. Marie,P. Ruterana,I. Monnet,J-M.Bluet,C. Bru-Chevallier ,Sensors and Transducers 2014, 27 217-Characterization and modeling
2. P. Ferrandis,M. El-Khatib,M-A Jaud,E. Morvan,M. Charles,G. Guillot,G. Bremond, J. A. P. 2019 125 35702 , doi/10.1063/1.5055926-Study of deep traps in AlGaN/GaN high-electron mobility transistors by electrical

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

Supervisor's email : jean-marie.bluet@insa-lyon.fr

Description of the research work proposed for a PhD ***Topic # (see list) :*** I-3;IV-7;

Title : Electro-optical characterization of beta phase of Ga2O3 epilayers grown on silicon and on Ga2O3 substrates.

Subject :

Gallium oxide (Ga2O3)under its monoclinic beta phase which is thermodynamically stable under ambient conditions, is a promising material for various applications in devices. Its transparency even to UV light due to its wide energy band gap of 4,9 eV gives prospective applications in UV applications,its high critical field of 8 MV/cm is promising for high voltage power applications and also in transparent contact when doped. Other advantages come from the availability of cheap bulk substrates, a large doping range for n-type and various existing epitaxy techniques (PVD, MOCVD, MBE,…).There are however severe bottlenecks for its development: 1) low value of thermal conductivity of Ga2O3 substrates, 2) difficulty to turn on of p-type doping, 3) high concentration of traps affecting the mobility, the carrier lifetime, the compensation of doping level and the voltage breakdown.
The focus of this thesis is to investigate by extensive and complementary characterizations the nature of native and impurity related defect centers in n (or p if available) type epi-layer grown on Si substrates in order to prevent disadvantage (1) by MOCVD (coll. GEMAC laboratory from Versailles university). The principal techniques we apply are admittance, deep level transient and optical spectroscopy (DLTS-DLOS) to access respectively to shallow and deep levels traps within the whole wide bandgap.

Keywords :

Wide bandgap semiconductor; oxyde semiconductor;electrical space charge characterization technique; I-V, C-V, DLTS; DLOS; capacitance; conductance; admittance spectroscopy; shallow level, deep level, traps, Schottky

Expected collaborations :

GEMaC-Versailles University;INSP- Institut des NanoSciences de Paris- CNRS

Background required from the applicant :

High general educational level in physics, mainly in solid-state and surface physics and in semiconductor physics . Good training in measurement techniques and apparatus instrumentation in semiconductor domain during his university cursus or during intership trainings- Training in semiconductor physics, devices and technology processes are wellcome.

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

(see guidelines on the website www-csc.utt.fr)