- Axe de GANEX : **7**
- Titre du sujet : **III-NITRIDE NEUTRON DETECTOR USING h-BN**
- Nom et e-mail du porteur de projet : **J.P. Salvestrini, jean-paul.salvestrini@georgiatech-metz.fr**
- Nature de la thèse *(effacer les mentions inutiles)*
  - Partagée académique : GANEX 50%, **UMI GT CNRS** : **50%**
- Date souhaitée de démarrage : **1/10/2017**
- Lien avec un projet ANR ou H2020: **international ANR project *BONSAÏ* déposé en 2016 with H. Amano (Japan)**
- Sujet développé :

Boron nitride (BN) and its alloys have emerged as an important multifunctional material system[1,2,3] with wide direct bandgap, high resistance to oxidation, and chemical inertness. Its high chemical and thermal stability allows it to be used in harsh environments. Being a boron-dense, large-bandgap semiconductor, BN is also a uniquely useful material for neutron detection, since it can both capture neutrons (^{10}B has a capture cross-section of ~3840 barnes) and detect the captured products[4,5,6,7].

In spite of its strong potential, BN is the least investigated among the III-N semiconductors because the growth of high crystalline quality has been proven to be challenging. Overcoming this challenge, i.e. growing electrically active BN and fabricating neutron detectors are the primary objectives of the proposed work. Several research programs on BN-based materials have been recently funded by research agencies at the international level (e.g., Darpa, DoD, NSF, Sandia National Laboratories) and demonstrated promising results.

The goal of the project is to thoroughly investigate the growth and the fundamental properties of boron containing materials on different substrates, including the vastly less expensive silicon. The project will focus on the growth of wafer scale (up to 2-inch in diameter) of planar and/or nanostructured (e.g., 2D atomic layers, nanorods, and nanostripes) h-BN films using a 4" state-of-the-art metal organic vapor phase epitaxy (MOVPE) system. In particular, this work will involve the use of metallorganic precursors containing ^{10}B (larger capture cross-section than ^{11}B)

The project also aims to develop a wafer-scale technology for neutron detector devices. Innovative h-BN-based neutron sensors will be fabricated using the experience gained from the recent results obtained in the framework[8,9,10] of the postdoctoral position of Xin Li funded in 2016 by Ganex at the UMI GT-CNRS. Metal-Semiconductor devices microfabrication process including ohmic and Schottky electrical contacts will be investigated.

Peoples involved:
UMI GT CNRS: Abdallah Ougazzaden, Paul Voss, Suresh Sundaram
Partners: L2C (Guillaume Cassabois, Bernard Gil, Optical characterization), C2N (Gilles Patriarche, STEM Characterization), Institut Lafayette (Simon Gautier, contact processing)

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