

Joint Physics Colloquium – TOP-SET Seminar

Le jeudi 29 novembre 2018, 14h45
Des rafraîchissements seront servis dès 14h15
Complexe de recherche avancée, pièce 233
Université d'Ottawa, 25, rue Templeton
Le séminaire se déroulera en anglais.

Thursday, November 29, 2018, 2:45 p.m.
Refreshments to be served starting at 2:15 p.m.
Advanced Research Complex, room 233
University of Ottawa, 25 Templeton Street

Group IV semiconductors:

A rich platform for integrated photonics, quantum technologies, and much more

Oussama Moutanabbir, École Polytechnique de Montréal

Abstract: Compound semiconductor alloys have been successfully used for a precise and simultaneous control of lattice parameters and bandgap structures bringing to existence a variety of functional heterostructures and low-dimensional systems. Extending this paradigm to group IV semiconductors will be a true breakthrough that will pave the way to creating an entirely new class of silicon-compatible optoelectronic, photonic, and quantum devices. With this perspective, I will describe strategies and new material systems to independently engineer lattice parameter and bandgap energy and directness by using the group IV elements Si, Ge and Sn. The ability to incorporate Sn atoms into Si and Ge at concentrations about one order of magnitude higher than the equilibrium solubility is at the core of these emerging potential technologies. In this presentation, I will address the epitaxial growth and stability of these metastable semiconductors in films and nanowires. We will also discuss the optical and electronic properties as well as the nature of the atomic order in Sn-rich GeSiSn. Strategies to integrate these semiconductors in fabrication of a variety of devices will also be presented. Finally, I will also describe our progress in the introduction of stable isotopes as an additional degree of freedom in the growth of semiconductor films and quantum structures. This isotope engineering provides a wealth of opportunities to manipulate their basic properties, design an entirely new class of devices, and highlight subtle but important nanoscale and quantum processes.

Bio: Oussama Moutanabbir is an Associate Professor and a Canada Research Chair in Nanoscale and Quantum Semiconductors at the department of Engineering Physics of the École Polytechnique de Montréal. He obtained a PhD degree in energy and materials sciences from University du Québec's Institut National de la Recherche Scientifique (INRS-EMT). Before taking his current position in Montréal, he worked as Project Leader at the Max Planck Institute of Microstructure Physics in Germany. He also held a joint appointment as an Invited Researcher at RIKEN Institute of Advanced Science in Japan between 2009 and 2015. Since 2008, he has been a visiting scientist at Northwestern University Center of Atom Probe Tomography. His research is in materials physics and engineering encompassing fundamental scientific and industrial activities. His main work focuses on expanding the fundamental understanding of basic physical properties of a variety of epitaxial group IV semiconductor nanomaterials and quantum systems. Additionally, his group is also actively involved in developing integration processes to enable a variety of cost-effective and high-performance optoelectronic, photovoltaic, and electronic devices.



TOP-SET est un programme de formation FONCER du CRSNG en puissance optoélectronique ayant pour but de façonner une cohorte de personnel hautement qualifié détenant des connaissances approfondies en systèmes optoélectroniques pour rejoindre les rangs d'équipes de recherche et développement.

NSERC CREATE Training in Optoelectronics for Power: from Science and Engineering to Technology (TOP-SET) is a training program that aims to form a cohort of highly qualified personnel with comprehensive understanding of optoelectronic systems, capable of joining advanced R&D teams.

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For further details regarding TOP-SET, go to create-topset.eecs.uottawa.ca.



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