Electronic Devices within Single Atomic Layer - Development of 2D Lateral Junctions

Department of Mechanical and Biomedical Engineering

Seminar Series

Centre for Robotics and Automation

Electronic Devices within Single Atomic Layer – Development of 2D Lateral Junctions

Dr. Jr-Hau HE
Associate Professor
King Abdullah University of Science and Technology (KAUST), Saudi Arabia

Date	October 26, 2017 (Thursday)
Time	3:00pm - 3:50pm
Venue	Rm G5-133, Yeung Kin Man Academic Building (AC1)

Abstract

With the demanding requirement of nanotechnology in the semiconducting industry, the challenge will become unprecedented as the fabrication approaches the scaling limit in the next few years. The rise of 2D materials seems to be a probable solution for developing the next-generation semiconducting devices. As 2D lateral junctions bring a revolutionary breakthrough in the past few years, nanoscale sized devices are no longer limited to the vertical direction. Doping and structural design strategies that are totally different from conventional Si based devices can bring about more ideal and ultra-efficient electronic and optoelectronic devices. This perspective summarizes and compares different methods of 2D lateral junction designs (including electrostatic tunable p-n homojunction and direct growth of in-plane p-n heterojunction) and various material combinations (including metallic-insulating, semiconducting p-n, and ohmic junctions). In addition, examples of design strategies and what can be achieved by adopting these 2D lateral junctions have been provided to show the promising potential for the future development. It can be expected that over the next few years, 2D materials will dominate the semiconducting industry and holds the promise for keeping the Moore's law alive.

About the Speaker

Research Interests:

- Understand the effects of nanomaterials on the performance of advanced devices.
- Development of transparent and flexible electronics using novel devices based on 2D materials, including solar cells and photodetectors, LEDs, and memory devices.
- Harsh electronics.
- Understand light scattering and trapping in nanostructured materials and designs for next-generation solar cells.
- Transport of charge carriers across these solar cells as well as the improvement in light coupling with the combined effect to increase the efficiency of separating the photoinduced charges.
- Emphasizes the transfer of the nanotechnology he developed to semiconductor and PV industry.

He has garnered over 2500 citations for a body of work ~140 peer reviewed journal articles with 30 of H factor over his career and had over 200 presentations in international conferences. His breakthrough researches have been highlighted over 50 times by various scientific magazines such as Nature, SPIE newsroom, IEEE SPECTRUM, EE Times, Semiconductor Today, Materials Today, Chemical & Engineering News, and Nano Today.

Teaching:

- Department of Electrical Engineering at KAUST

Enquiry: 3442 8420

All are Welcome!