הטכניון - מכון טכנולוגי לישראל

TECHNION - ISRAEL INSTITUTE OF TECHNOLOGY

הפקולטה להנדסה כימית
ע"ש וולפסון
The Wolfson Department of Chemical Engineering

Wolfson Department of Chemical Engineering Special Seminar

Lecture Hall 6, Wolfson Department of Chemical Engineering,

31st March, 2016, at 13:30

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Growth and Surface Engineering of Nanowires for Optoelectronic Applications

Nanowires (NWs) are a promising candidate for the realization of highly integrated electronic, photonic and optoelectronic devices as well as for fundamental studies in natural sciences.

The lecture will be divided into three parts: (i) Realizing semiconducting NWs, in particular, we will show bottom-up vapor–liquid solid growth as well as a top-down approach by wet and dry etching, (ii) Chemical surface functionalization and optoelectronic characterization, and (iii) NWs integration into device prototypes.

Remarkably, as the dimensions are scaled down, the surface and interface area of NWs become more critical – to the level that they might control the whole NW opto-electronic properties. It is therefore essential to understand the surface properties and charge exchange between the NW surfaces and their bulk on a microscopic level. In particular, we show molecular approach to modify the NW surfaces through covalent bonds related electronics. The main analytical tool adopted in our research towards this goal is photoelectron spectroscopy and kelvin probe. Band diagrams will be extracted from based on this analysis and correlated with electrical and material properties of the NWs. Along this route, we have developed a new *surface doping* technique in contrast to the conventional doping approach (doping via Boron or Phosphorus to obtain p and n type respectively). Our technique based on a combination of work function engineering and phys/chem adsorption of appropriate dopant molecules (organometallic complexes) at the surface.

The perspectives of our results for NW based devices, specifically with respect to efficiency enhancement of field effect transistors and hybrid solar-cells will be discussed.

Refreshments served at 13:15