SM-P012

Novel Optical Properties of Si Nanowire Arrays

Munhee Lee[1], Minji Gwon[1], Yunae Cho[1], Dong-Wook Kim[1]

[1]Department of Physics, Ewha Womans University, Seoul, 120-750, Korea

Si nanowires have exhibited unique optical characteristics, including nano- antenna effects due to the guided mode resonance, significant optical absorption enhancement in wide wavelength and incident angle range due to resonant optical modes, graded refractive index, and scattering. Since Si poor optical absorption coefficient due to indirect bandgap, all such properties have stimulated proposal of new optoelectronic devices whose performance can surpass that of conventional planar devices. We have carried out finite-difference time-domain simulation studies to design optimal Si nanowire array for solar cell applications. Optical reflectance, transmission, and absorption can be calculated for nanowire arrays with various diameter, length, and period. From the absorption, maximum achievable photocurrent can be estimated. In real devices, serious recombination loss occurring at the surface states is known to limit the photovoltaic performance of the nanowire-based solar cells. In order to address such issue, we will discuss how the geometric parameters of the array can influence the spatial distribution of the optical field (resulting optical generation rate) in the nanowires.

Keywords: Silicon, Nanowire, Solarcell

SM-P013

Charge Transport at the Interfaces between Carbon Nanotube and Wetting Metal Leads Mediated via Topological Defects

Kwan Ho Ko, Han Seul Kim, Hu Sung Kim, and Yong-Hoon Kim*

Graduate School of EEWS, KAIST, 291 Daehak-ro,
Yuseong-gu, Daejeon 305-701, Korea

Carbon nanotubes (CNT)-metal contacts play an important role in nanoelectronics applications such as field-effect transistor (FET) devices. Using Al and (10,0) CNT, we have recently showed that the CNT-metal contacts mediated via topological defects within CNT exhibits intrinsically low contact resistance, thanks to the preservation of the sp2 bonding network at the metal-CNT contacts.[1] It is well-established that metals with good wetting property such as Pd consistently yield good contacts to both metallic and semiconducting CNTs. In this work, the electronic and charge transport properties of the interfaces between capped CNT and Pd will be investigated based on first-principles computations and compared with previous results obtained for the Al electrodes.

Reference

[1] H. S. Kim, H. S. Kim, G. I. Lee, J. K. Kang, and Y.-H. Kim: Intrinsically low-resistance carbon nanotube-metal contacts mediated by topological defects. MRS Communications 2, 91-96 (2012).

Keywords: density functional theory, carbon nanotube, contact resistance, Schottky barrier, wetting metal