

Integrated Nano Optoelectronics

Moon-Ho Jo

Department of Materials Science and Eng., Yonsei University

Si:Ge alloy semiconductor nanocrystals (NCs) offer challenging opportunities for integrated optoelectronics/optoplasmonics, since they potentially allow unprecedentedly strong light-matter interaction in the wavelength range of the optical communication. In this talk, we discuss the recent research efforts of my laboratory to develop optoelectronic components based on individual group IV NCs. We present experimental demonstration of the individual NC optoelectronic devices, including broadband Si:Ge nanowire (NW) photodetectors, intra NW p-n diodes, Ge NC electrooptical modulators and near-field plasmonic NW detectors, where the unique size effects at the nanometer scales commonly manifest themselves. In particular, we demonstrated a scanning photocurrent imaging technique to investigate dynamics of photocarriers in individual Si:Ge NWs, which provides spatially and spectrally resolved local information without ensemble average. Our observations represent inherent size-effects of internal gain in semiconductor NCs, thereby provide a new insight into nano optoplasmonics.