Abstract

Recently, many novel molecular agents and probes have been developed for their use as sensors and proximal probes for the analysis of local nanoenvironment. For instance, the utility of these nanoscale materials including fluorescent nanocrystals (quantum dots or Qdots), nanoshells, and nanotubes has been extended towards many bioimaging applications to achieve quantitative imaging contrast. The current challenge for the application of these novel probes for quantitative application is to characterize and model the unique optical properties of these nanoscale materials and quantify how biochemical environments change these properties towards their use as bioimaging agents in a complex environment. We have been developing and utilizing new measurement platforms and standards to characterize and model the unique optical properties of these nanoscale materials in a controlled environment for their applications as quantitative biosensors and detectors. A variety of self-assembly techniques have also been developed to engineer nanocomplexes of biomolecules and nanomaterials for a variety of potential applications in biological and biomedical studies including cellular diagnostics, repair, and modification, cancer detection, in vivo imaging, biological warfare agent detection, and drug research and development. This talk will present our recent efforts on the optical metrology of single bio-conjugated nanocrystals, bioengineering of bacteriophage-nanocrystal complexes, and manufacturing and assessing of nanoscale molecular delivery systems employing fluorescent nanocrystals associated by bio molecules.
Jeeseong Hwang is a biophysicist at the National Institute of Standards and Technology (NIST) of US Department of Commerce. He holds an undergraduate degree in physics from Seoul National University and a Ph.D. from Michigan State University in the field of condensed matter physics on the scanning tunneling microscopy of quantum structures and dynamics. His work at NIST began with an award of US National Research Council Fellowship (1994-1996) in near-field optical scanning probe microscopy. Before coming to NIST, he was a research scientist at the Johns Hopkins University investigating immunological aspects in human cells using laser and near-field scanning optical microscopy in collaboration with AT&T Bell Laboratories. He has been conducting research on several multidisciplinary projects on the real-world application of a variety scanning probe microscopes, nanooptical metrology involving near-field detection of biomolecules and biological cells, and nano-biotechnology investigating biomedical applications of a variety of nanomaterials (quantum dots and nanotubes) and novel imaging techniques using lasers and opto-electronic devices. He has published about 50 research papers in major journals.