



Excited quantum dots coupled with fiber surface plasmon polaritons

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Abstract:

We study the optical coupling between excited state quantum dots (QDs) CdSe/ZnS and fiber surface plasmon polariton at visible wavelengths. We use the bimetal coated fiber core of multimode optical fiber to excite the surface plasmons. QDs are then immobilized on the bimetallic film surface for the coupling between QDs and surface plasmons. We employ a ultraviolet-visible (UV-VIS) spectrophotometer to examine the absorbance peak shift due to the presence of QDs which are excited by a white light source. In contrast to the previous report that showed the red shift due to light absorbing molecules immobilized on metal surface, we observe the blue shift of the plasmonic spectral resonance due to the presence of QDs adsorbed on metal surface. To explain the blue shift, we invoke the negative change in refractive index stemming from emission/gain properties of the excited QDs in the context of Kramers-Kronig relation. Interestingly, magnitude of such blue shift exhibits the oscillatory feature as a function of spectral difference between the QD-free surface plasmon resonance wavelength and the QD emission wavelength of 560 nm. This study may contribute to a better understanding of QD involving plasmonic devices that can find an use in application in biomedical and environmental sensor platforms.



Biography:

HEONGKYU JU completed his D.Phil degree in the area of nonlinear quantum optics, from the department of condensed matter physics, University of Oxford, United Kingdom, 2003. He extended his research to the ultrafast all-optical switching and nonlinear nano-photonics by working as the research associates at the department of electrical Engineering, Technical University of Eindhoven, Netherlands, and Photonic Nanostructure Research Group, NTT Basic Research Laboratories, Japan, before joining the department of Nano-Physics, Gachon University, Korea, as a faculty member, 2007. He has published over sixty peer-reviewed journal papers (excluding the conference ones) in various fields.