TN-003 <Invited Talk>

Nanoplasmonic Spectroscopic Imaging and Molecular Probes

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Label-free, sensitive and selective detection methods with high spatial resolution are critically required for future applications in chemical sensor, biological sensor, and nanospectroscopic imaging. Here I describe the development of Plasmon Resonance Energy Transfer (PRET)-based molecular imaging in living cells as the first demonstration of intracellular imaging with PRET-based nanospectroscopy. In-vivo PRET imaging relied on the overlap between plasmon resonance frequency of gold nanoplasmonic probe (GNP) and absorption peak frequencies of conjugated molecules, which leads to create ‘quantized quenching dips’in Rayleigh scattering spectrum of GNP. The position of these dips exactly matched with the absorption peaks of target molecules. As another innovative application of PRET, I present a highly selective and sensitive detection of metal ions by creating conjugated metal-ligand complexes on a single GNP. In addition to conferring high spatial resolution due to the small size of the metal ion probes (50 nm in diameter), this method is 100 to 1,000 folds more sensitive than organic reporter-based methods. Moreover, this technique achieves high selectivity due to the selective formation of Cu2+complexes and selective resonant quenching of GNP by the conjugated complexes. Since many metal ion ligand complexes generate new absorption peak due to the d-d transition in the metal ligand complex when a specific metal ion is inserted into the complex, we can match with the scattering frequency of nanoplasmonic metal ligand systems and the new absorption peak.

Keywords: Plasmonic, Spectroscopy, Imaging