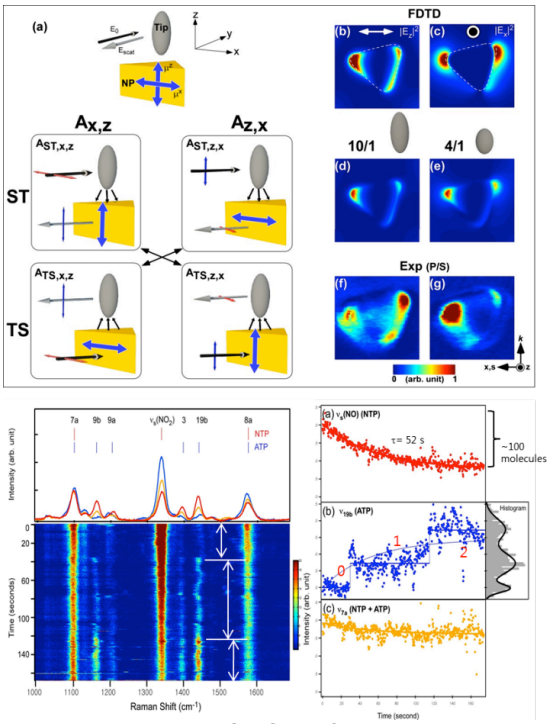
Plasmonics for Single-Molecule Photochemistry and Optical Nanoscopy

Zee Hwan Kim
Department of Chemistry, Korea University, Seoul, Korea

I will introduce my group's recent effort on nano-plasmonics and its application to single-molecule kinetics and optical nanoscopy. First, I will present near-field microscopy studies on isolated and dimerized gold nanocubes to directly investigate the strong coupling between two adjacent nanoparticles. The plasmon maps of nanoparticle dimers unambiguously prove that the strong Coulombic attraction between the charges at the interparticle gap dominates over the intra-particle charge oscillations, which is qualitatively different from those expected from dipole-dipole coupling. Secondly, I will demonstrate the use of well-defined gap-plasmons to locally drive a photochemical reaction, and follow the reaction kinetics of individual product molecules using the surface-enhanced Raman scattering (SERS). As a further application of nano-plasmonics, I will demonstrate the use of infrared near-field microscopy to identify two different stacking structures, the rhombohedral (ABC) and Bernal (ABA), of multilayer graphenes at 10 nm spatial resolution.



(top) Polarized tip-sample interaction in the s-SNOM of a nanoparticle; (bottom) The SERS intensity trajectories of reaction products of p-nitrobenzenethiolates.