Nearfield nano-optics for surface molecular chemistry and 2D semiconductor

Abstract: Surface and interfaces play crucial roles on heterogeneous catalysis, light-harvesting system, and battery technology. Nearfield nano-optics has been rising fast as a powerful technique for surface science with advantages of surface-sensitivity and spatial resolution. For the first part, I will focus on plasmon enhanced Raman spectroscopy methodology. The localized nearfield produced by the excitation of localized surface plasmon resonances (LSPRs) dominates the overall enhancement of surface enhanced Raman spectroscopy (SERS) and tip enhanced Raman spectroscopy (TERS). However, such an electromagnetic enhancement is unfortunately accompanied by a strong modification of the original Raman spectra, which highly distorts spectral features providing chemical information. I will talk about a general and robust method we proposed to retrieve the reliable fingerprint of intrinsic chemical information from SERS and TERS. Further applying TERS on 2D materials like MoS2 will also be discussed. For the second part, I will talk about my internship experience on probing hot electron catalysis using s-SNOM and ultrafast adiabatic nanofocusing. Finally, I will briefly introduce the ideas of my current researches on WSe2/Black phosphorus heterostructure and second harmonic generation of WSe2, which will be detailed in Lupton Chair Seminar (Nov. 27th).