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Imaging and Spectroscopy at 10nm Spatial Resolution using s-SNOM

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The performance of the next-generation electronic devices based on plasmonic nanomaterials is strongly influenced by the structure-function relationship. Scattering-type scanning near-field optical microscopy (s-SNOM) is the ideal technology to investigate such material systems at the nanoscale.

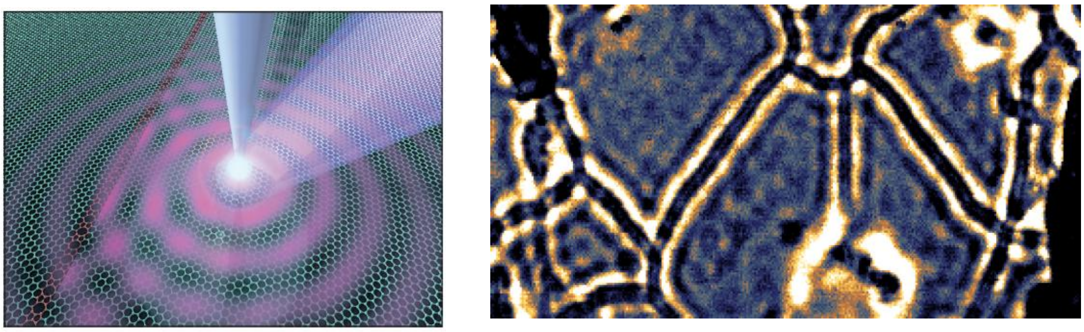

Figure 1 Left: Diagram of the Infrared nano-imaging experiment. Concentric circles illustrate plasmon waves launched by the illuminated tip. Right: Image of infrared amplitude recorded on a graphene 1x2 μm^2 area. This image shows a characteristic plasmon interference pattern close to graphene edges and grain boundaries.

s-SNOM combines the best of two worlds: (i) the high spatial resolution of Atomic Force Microscopy (AFM) and (ii) the analytical power of optical microscopy and spectroscopy. Achieving an unmatched spatial resolution below 10 nanometer this technology opens a new era for modern nano-analytical applications such as chemical identification, free-carrier profiling and plasmonic near-field mapping. Recent research highlights on graphene and other 2D materials include contact-free access to the local conductivity, the electron mobility, and the intrinsic electron doping by resolving propagating phonon- plasmon (Fig 1), exciton-polariton directly in space and time, at RT and cryogenic conditions (5K).

This talk will introduce the basic principles of near-field microscopy for imaging and spectroscopy with 10 nanometer spatial resolution, correlative measurement (optical, photocurrent and AFM) and address heir impact and key applications in the field of plasmonic materials.