**Developing Broad-band Near-field Infrared Microscopy at the ALS**

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The chemical specificity of infrared vibrational spectroscopy has early on generated the desire for simultaneous spatial resolution to determine the microscopic composition of a sample. The coupling of FTIR with an IR microscope allows for micro-spectroscopy and mapping the chemical composition of a sample. Synchrotron infrared beamlines (such as at the NSLS and ALS) have provided a high-brightness IR source giving the ability to obtain high quality spectral images at diffraction-limited spatial resolutions. But with mid-infrared wavelengths between 3 and 20 microns, the diffraction limited resolution achieved is at best 1.5 – 10 microns. Being able to measure chemically unique IR spectra at the nanometer scale would be a revolution in the field. Using a single wavelength IR laser as a source, improved spatial resolution has been realized taking advantage of the local-field enhancement and scattering of nanoscopic metal probe tips scanned in close proximity to the sample by means of atomic force microscopy. In these scattering scanning near-field infrared microscopy (s-SNIM) experiments, the resolution is limited by the size of the scanning tip, which can be 10 nm or even better. Obtaining complete IR spectra at the nano-scale is very desirable in order to provide complete vibrational and electronic identities within the nanoimage. This requires a high-brightness broadband infrared light source, perhaps a synchrotron IR beamline. Our objective of this project is to demonstrate near-field infrared vibrational spectroscopic imaging with nano-scale spatial resolutions using the ALS IR beamline radiation. This talk will provide an update on our successes and challenges to date.