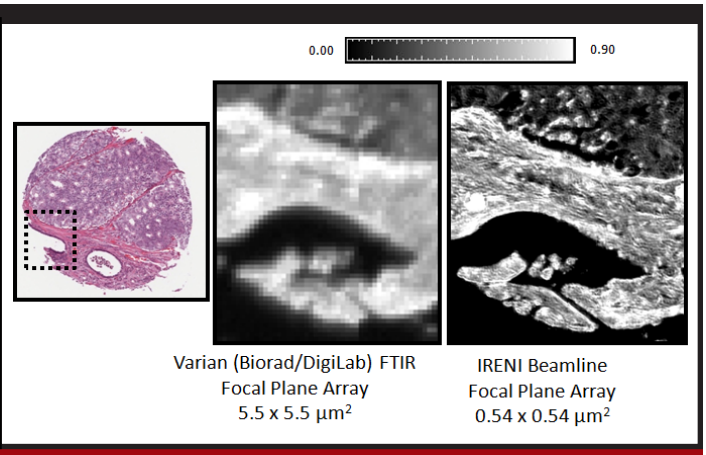
3:30 pm • Friday February 24, 2012 • 2241 Chamberlin Hall • Coffee at 4:30 pm

Carol Hirschmugl

UW-Milwaukee,
Department of Physics



FT-IR spectrochemical imaging: Design and applications with Focal Plane Array and multiple beam synchrotron radiation source

Department of Physics Colloquium

WISCONSIN

FT-IR spectrochemical imaging, which combines the chemical specificity of mid-infrared spectroscopy with spatial specificity, is an important demonstration of label-free molecular imaging. Mid-infrared optical frequencies are resonant with the vibrational frequencies of functional groups, thus an absorption spectrum is a "molecular fingerprint" of the material at every pixel. Each spectrum can be correlated with known material properties to extract chemical information. Synchrotron based FT-IR spectrochemical imaging, as recently implemented at the Synchrotron Radiation Center in Stoughton, WI, demonstrates the new capability to achieve diffraction limited chemical imaging across the entire mid-infrared region, simultaneously, with high signal to noise ratio.

IRENI (Infrared Environmental Imaging) extracts a large swath of radiation (320 hor. × 25 vert. mrads2) to homogeneously illuminate a commercial IR microscope equipped with an infrared Focal Plane Array (FPA) detector. Wide field images are collected. IRENI rapidly generates high quality, high spatial resolution data. The relevant advantages (spatial oversampling, speed, sensitivity and signal to noise ratio) will be presented and demonstrated using examples from a variety of disciplines, including formalin fixed and flash frozen tissue samples, live cells, fixed cells, paint cross sections, polymer fibers and novel nano-materials will be presented.

M.J. Nasse, et al. "High resolution Fourier-transform infrared chemical imaging with multiple synchrotron beams", Nature Methods, 8, (2011) 413-416

E.C. Mattson, et al. "Evidence of Nanocrystalline Semiconducting GRaphene Monoxide During Thermal Reduction of Graphene Oxide in Vacuum," ACS Nano 5, pp 9710–9717

M.Z. Kastyak-Ibrahim, et al. "Biochemical label-free tissue imaging with subcellular –resolution synchrotron FTIR with Focal Plane Array Detector," NeuroImage 60, (2012) 376-383.

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