BSISB
Berkeley Synchrotron Infrared Structural Biology Imaging Program
ALS INFRARED BEAMLINES 1.4 & 5.4

A national user program for imaging living cells, biological and biogeochemical materials

Visit our website: http://bsisb.lbl.gov

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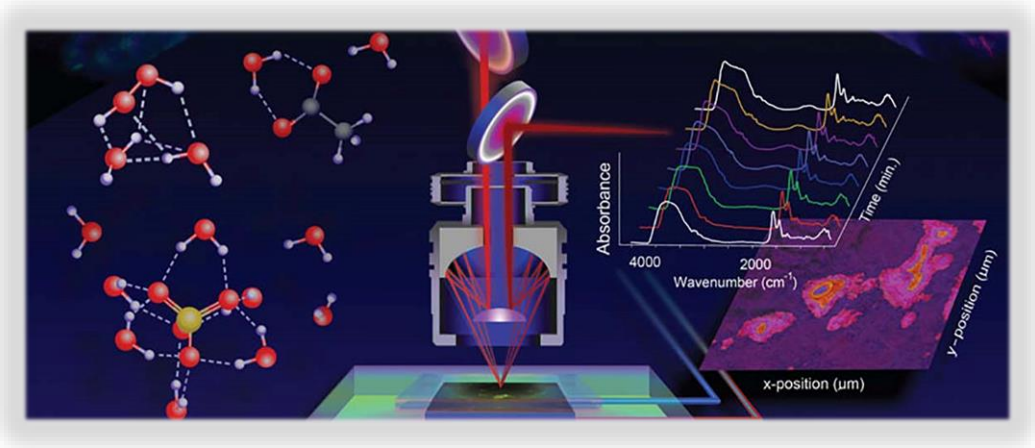
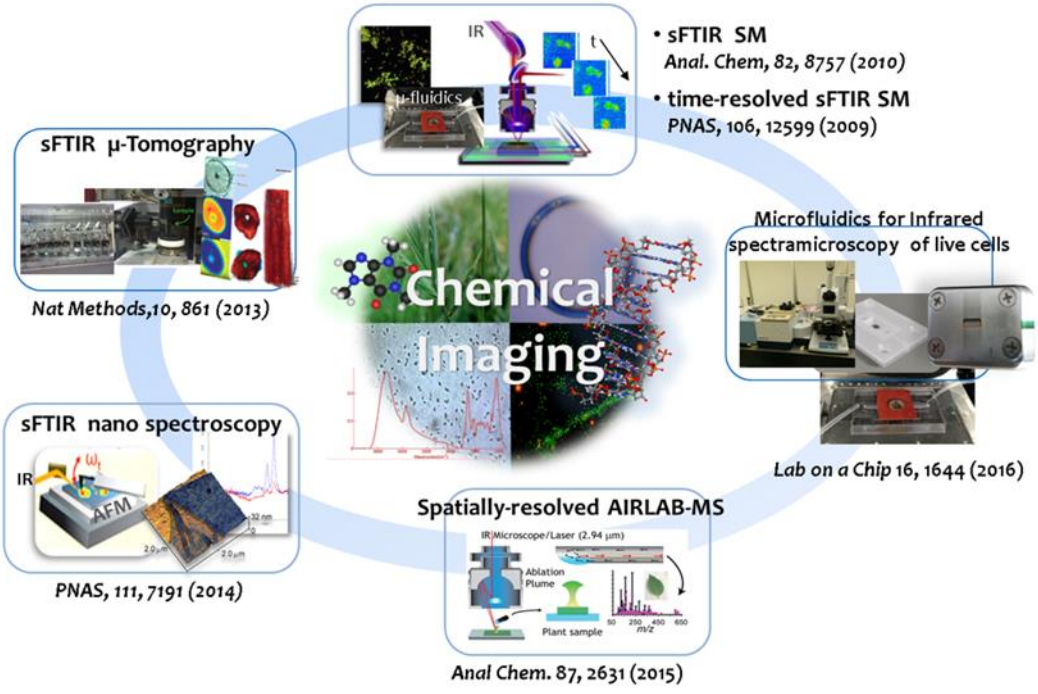


Imaging Capabilities and Technologies at a Glance

BSISB develops facilities, user training, and user support for researchers investigating cellular chemistry and function at infrared beamlines. Our program focuses on synchrotron radiation–based Fourier transform infrared (SR-FTIR or sFTIR) spectromicroscopy, time-resolved sFTIR spectromicroscopy, synchrotron Infrared Nano-Spectroscopy (SINS), and 3D synchrotron FTIR micro-tomography (sFTIR µTomography). Other complementary microscopy and spectroscopic imaging methods include fluorescence microscopy, Raman microscopy, simultaneous optical hyperspectral sample imaging, and spatially-resolved AIRLAB mass spectrometry.

Technology Available at the BSISB Program Facility



Current Resolution Range

- **Label-free sFTIR microscopy** can reveal biochemical and biogeochemical processes in specimens with a spatial resolution from 2 to 15 µm.
- **Time-resolved sFTIR imaging** can monitor the dynamics of biochemical and biogeochemical processes in live microbes and biofilms over the course of seconds to hours and days.
- **sFTIR spectro-microtomography** is a technique in development for visualizing the 3D biochemical distribution in samples of interest with a spatial resolution between 2 and 15 µm.
- Broadband **Synchrotron Infrared Nano Spectroscopy (SINS)** is currently in development to measure chemical distribution in samples with a spatial resolution of 20 nm.

Selected BSISB User Publications

1. **High-spatial-resolution mapping of catalytic reactions on single particles**. Wu CY, Wolf WJ et al. *Nature*, 541 (7638), pp. 511, 2017.

2. **Direct observation of narrow mid-infrared plasmon linewidths of single metal oxide nanocrystals.** Johns RW, Bechtel HA et al. *Nature Communications*, 7, pp. 11583, 2016.

3. **Belowground Response to Drought in a Tropical Forest Soil. II. Change in Microbial Function Impacts Carbon Composition**. Bouskill NJ, Wood TE et al. *Frontiers in Microbiology*, 7, pp. 323, 2016,

4. **IR-Live: Fabrication of a low-cost plastic microfluidic device for infrared spectromicroscopy of living cells** Birarda G, Ravasio A et al. *Lab on a Chip*, 2016).

5. **Diverse uncultivated ultra-small bacterial cells in groundwater**. Luef, Birgit; Frischkorn, Kyle R;] *Nature Communications*, 6, pp. 6372, 2015.

6. **Installing extra bicarbonate transporters in the cyanobacterium Synechocystis sp. PCC6803 enhances biomass production**. Kamennaya NA, Ahn SE et al. *Metaboic Engineering*, 29, pp76, 2015.

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