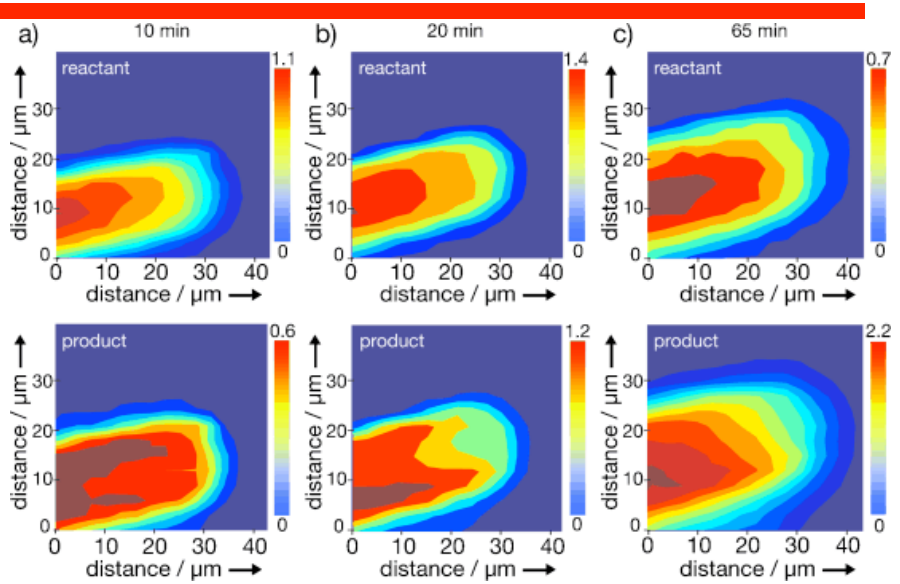
# Full-Field Infrared Spectroscopic Imaging (IRI)

## IRI at NSLS-II

- Will enable in-situ studies of organic composition of materials by vibrational spectroscopy
- Measurements from microseconds to days with micromolar detection sensitivity and sub-micron spatial resolution
- The combination of the high brightness and low noise of NSLS-II with a high throughput imaging system will be world leading

## Examples of Science Areas & Impact

- CATALYSIS: In zeolite catalysis, simultaneously image reactants and products in real time for a mechanistic picture of in situ zeolite reaction chemistry
- POLYMERS: In polymer-fiber composites, image interface morphology under sheer and stretch conditions in situ
- MICROBIOLOGY: In cellulose degradation by bacteria, rapidly image reaction location, rate, and chemical intermediates for improved biofuel production
- MEDICINE: In Lou Gehrig's disease, simultaneously image the formation, structure, and associated cellular toxicity of intracellular superoxide dismutase aggregates




Raster scanned infrared images of a zeolite crystal reacted with 2-chlorothiophene after a) 10, b) 20, and c) 65 min of reaction for the 1412 $cm^{-1}$ reactant band (top) and 1401 $cm^{-1}$ product band (bottom). IRI will enable real-time imaging at much faster time scales without raster-scanning. M. Kox et al., *Angewandte Chemie*, 48, 8990 (2009).

## Beamline Capabilities

**TECHNIQUE(S):** Fourier transform infrared spectroscopic imaging with a 64x64 focal plane array detector

**SOURCE:** dual dipole magnets

**ENERGY RANGE / RESOLUTION:** 500 – 4000 $cm^{-1}$ / 1 $cm^{-1}$

**SPATIAL RESOLUTION:** ~1 – 5 µm with pixel oversampling and image deconvolution

U.S. DEPARTMENT OF ENERGY

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