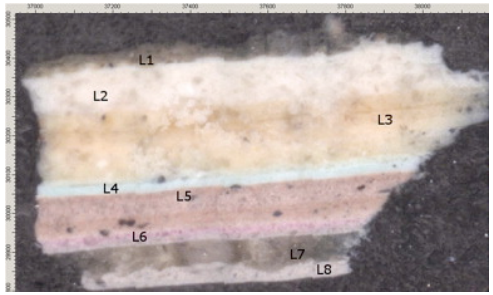
Advanced Infrared Microspectroscopy (AIM)

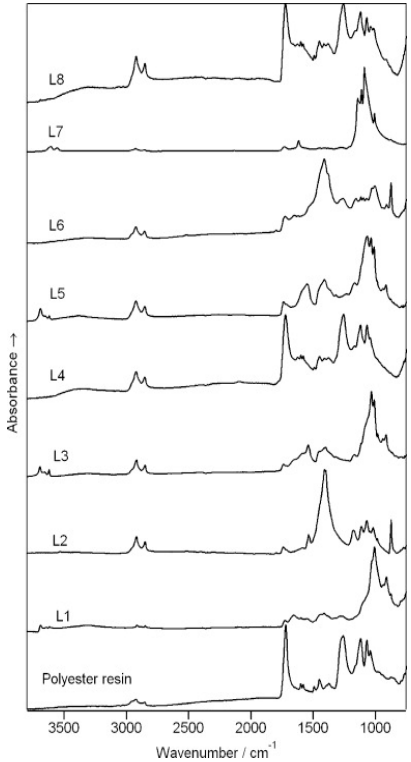
AIM at NSLS-II

- Will enable high resolution studies of organic composition of materials by vibrational spectroscopy
- Measurements with sub-micromolar detection sensitivity and sub-micron spatial resolution
- Combination of high brightness and low noise of NSLS-II with a confocal imaging system will be world leading

Examples of Science Areas & Impact

- GEOSCIENCES: In small particulates from earth and space, determine the composition of soil contaminants, space dust, and fluid inclusions
- CULTURAL HERITAGE: In artifacts such as paint cross-sections, evaluate the chemical makeup of each sub-micron thick layer
- MICROBIOLOGY: In microbe remediation of the Gulf Oil Spill, determine reaction intermediates and resulting metabolites
- MEDICINE: In bone disease, image the collagen and mineral structure and composition in microdamaged, treated, and repaired bone





(Above) Paint cross-section from the exterior wall of the Provincial Hotel in Melbourne, Australia. Some layers are < 1 micron thick. (Right) FTIR micro-spectra from the individual paint layers. AIM will enable higher resolution imaging of thinner layers and minor components in layered structures. R. Sloggett, et al., *Vibr. Spectr.*, 53: 77-82 (2010).

Beamline Capabilities

TECHNIQUE(S): Fourier transform infrared micro-spectroscopy (FTIRM)

SOURCE: dipole magnet

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

SPATIAL RESOLUTION: ~1 – 5 μm (diffraction-limited)

U.S. DEPARTMENT OF ENERGY

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