Frontier Synchrotron Infrared Spectroscopy Beamline under Extreme Conditions (FIS)

FIS at NSLS-II

- Will enable in-situ optical studies of a wide variety of materials by spectroscopic techniques at extreme P-T conditions (to several hundred GPa and 4~6000 K)
- Measurements of far-infrared to visible spectra with diffraction-limited spatial resolution
- The combination of the high brightness and low noise of NSLS-II with dedicated high-pressure facilities will be unique and world leading

Examples of Science Areas & Impact

- EARTH AND PLANETARY SCIENCES: mimic the mantle extreme conditions and study the Earth’s deep water cycle
- MATERIAL SCIENCES: study metallization of hydrogen and hydrogen-rich materials under extreme conditions
- DEEP CARBON CYCLE RESEARCH: study behavior of carbon-bearing materials in Earth’s deep interior conditions by vibrational spectroscopy
- DYNAMIC COMPRESSION: probe material behavior on short time scales combined with the pulsed synchrotron radiation

Beamline Capabilities

TECHNIQUE(S): Fourier transform infrared spectroscopy; diamond anvil cell techniques for static high pressure; gas-gun launchers for dynamic compression; cryogenic techniques combined with DACs; laser heating techniques combined with DACs

SOURCE: large-gap (90 mm) dipole magnets

ENERGY RANGE / RESOLUTION: 50 – 10000 cm⁻¹ / 1 cm⁻¹

SPATIAL RESOLUTION: diffraction limited resolution in the entire energy range

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