☐ **Talk** ☒ **Poster**

Geochemical and Environmental Science Program at Integrated In-Situ and Resonant Hard X-ray Studies (ISR) Beamline, NSLS-II

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The 4-ID Integrated In-situ and Resonant Hard X-ray Studies (ISR) beamline at NSLS-II is a powerful tool for advancing geochemical and environmental science. With tunable X-ray energy up to 23 keV and capabilities such as resonant scattering, reflectivity, crystal truncation rod measurements, grazing incidence small-angle X-ray scattering, and grazing incidence diffraction, 4-ID provides element-specific, interface-sensitive techniques ideally suited for studying realistic environmental systems. Equipped with both point and area detectors and a focused beam (~40 μm × 400 μm), the 6-circle diffractometer endstation at the beamline is optimized for interface-sensitive measurements. It supports a wide range of in-situ and operando geochemical and environmental experiments using liquid- and gas-flow cells, enabling real-time observation of environmental processes such as mineral-contaminant interactions, crystal nucleation and dissolution, redox transformations, and surface thin-film formation. With upcoming capabilities for precise control of temperature, pressure, humidity, and gas environments, 4-ID allows researchers to mimic realistic natural and engineered environments. This makes it a vital platform for understanding and addressing environmental challenges at the molecular scale.