

QUICK X-RAY ABSORPTION AND SCATTERING (QAS)

SCIENTIFIC SCOPE

QAS (Quick x-ray Absorption and Scattering) will enable *in situ* studies of chemical and physical transformations by both quick and regular x-ray absorption and scattering measurements. It will provide for the investigation of fast kinetics of samples from the fields of catalysis, energy storage/conversion and other scientific disciplines. It will allow measurements using separate and combined XAS and XRD techniques, as well as combining these techniques with those provided by end stations with IR and Raman spectroscopy capabilities, in different sample environments.

BEAMLINE CHARACTERISTICS

TECHNIQUES:

- Quick and conventional XAS (transmission and fluorescence)
- Quick and conventional XRD

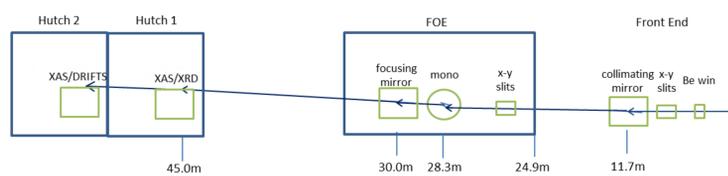
DETECTORS

- PerkinElmer 1621 area detector
- Vortex Si-drift
- Gridded ion chambers
- Canberra PIPS
- Canberra multi-element Ge

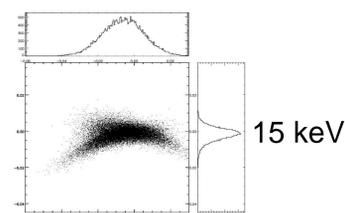
SAMPLE ENVIRONMENTS

- Closed-cycle He refrigerators: $T > 10\text{K}$
- In-situ Clausen cells: $25^\circ\text{C} - 700^\circ\text{C}$
- In-situ Nashner-Adler reaction cells: $-150^\circ\text{C} - 500^\circ\text{C}$
- Large Clam Shell furnace reactor: $25^\circ\text{C} - 900^\circ\text{C}$
- In-situ high P, high T XAS flow cell: T to 600°C and P to 1200 psi (83 bar)
- In-situ, custom made XAS-DRIFTS cell: $25^\circ\text{C} - 700^\circ\text{C}$

BEAMLINE DESIGN



PERFORMANCE ESTIMATES



E (keV)	FWHM H (mm)	FWHM V (mm)	FWHM div H' (mrad)	FWHM div V' (mrad)	Estimated flux (ph/s)
5	0.255	0.070	1.28	0.123	6.4E11
10	0.260	0.064	1.24	0.129	7.9E11
15	0.262	0.067	1.21	0.130	5.4E11
20	0.270	0.063	1.20	0.114	2.9E11
25	0.263	0.059	1.18	0.110	1.1E11
30	0.257	0.057	1.21	0.092	3.8E10

Collimating mirror – 700mm long; Rh and Pt stripes
 Mono: quick-scan capable monochromator
 Toroidal focusing mirror – 1000mm long; Rh-coated

Overview

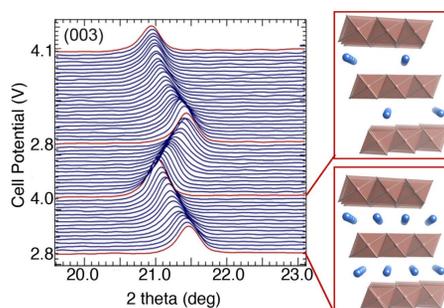
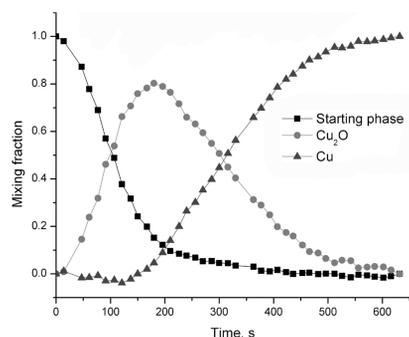
- PORT:** 7-BM
- SOURCE:** 3-pole wiggler
- ENERGY RANGE:** 4.7 – 31 keV
- ENERGY RESOLUTION:** $\Delta E/E = 10^{-4}$
- BEAM SPOT SIZE** (in focused mode): less than 1.0H x 0.5V (mm)
- PHOTON FLUX:** up to 10^{12} ph/s (10 keV)
- BEAMLINE STATUS:** Construction
- AVAILABLE TO USERS:** 2018-2

Beamline Staff

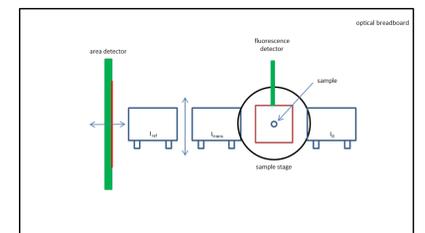


Steven N. Ehrlich
Lead Beamline Scientist

SCIENTIFIC APPLICATIONS



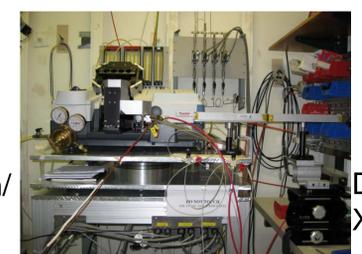
QEXAFS



XAS/XRD



Raman/
XAS



DRIFTS/
XAS

CATALYSIS: Investigations of structure, kinetics, dynamics and reactivity during *in situ* transformations with short time resolution

ENERGY GENERATION AND STORAGE: Understanding the physical and chemical processes in batteries and fuel cells

COMPLEMENTARY PROBES: Investigate complex interactions in systems at time scales from tens of ms to hours and length scales from Å to μm