Let’s get ourselves some XAS on that sample

A practical guide to explore

- What samples can be measured?
- What sample environments are available?
- How do I apply for time?
- A summary of handy resources

A typical year in the life of the XAS beamline

180 proposals submitted for beamtime

< 60 proposals successful

Scheduled & completed

55 journal publications*

> 120 proposals unsuccessful

Fact:
most proposals don't get time
Truth:
just following the guidelines
will ***improve*** your chances

Resubmit at the next opportunity

* of which about 1/3 are co-authored with staff

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So, beamtime can be quite elusive
-> what do I need to consider before applying?

Are my samples suited?

- We can measure most samples, be they solids or liquids, amorphous or crystalline, dilute or concentrated, ex-situ or in-situ, at room temperature or cryogenic.
- Ideally, you have a few mg of sample available and the element of interest is present at > 10 ppm (a few percent is better).
- You need to consider overlapping absorption edges, and overlapping emission lines -> check the X-ray Data Booklet.
- You need to consider other absorbing material that is part of your samples -> check CXRO, XAFS Mass, sample prep document online.
- Large scale user supplied equipment -> Hutch C
- No modifications to our standard setup/table in Hutch B is allowed.

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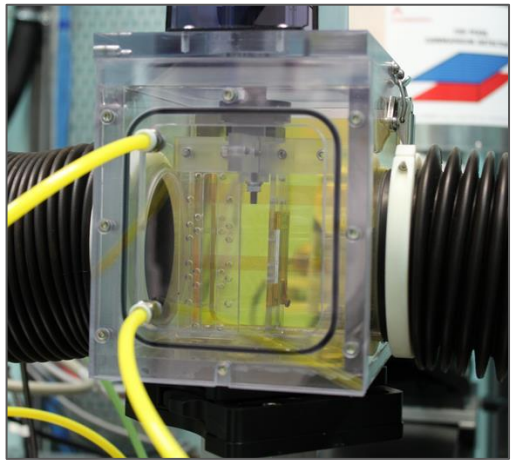
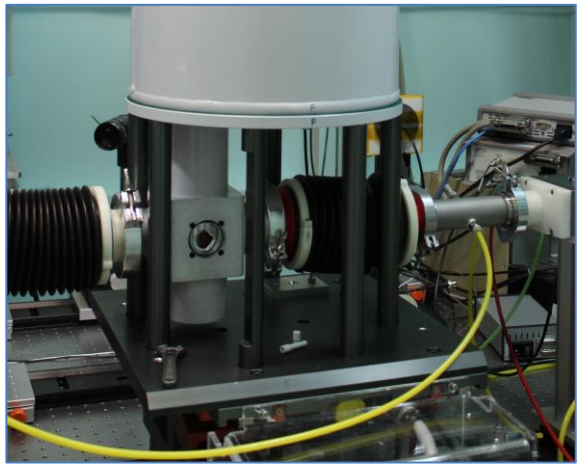
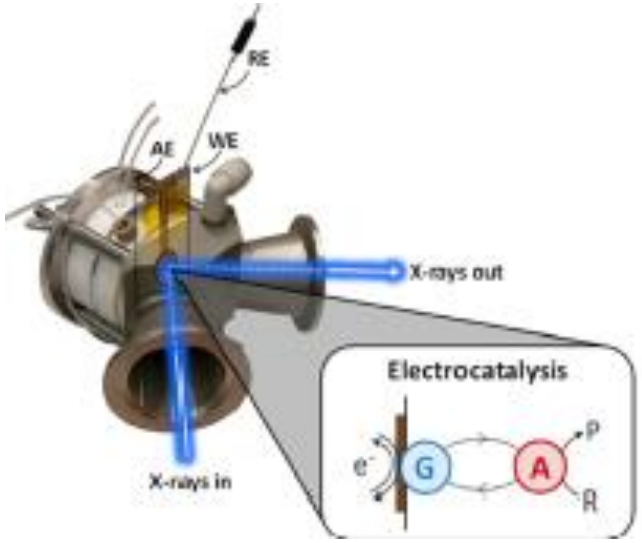
Sample environments – all available in Hutch B



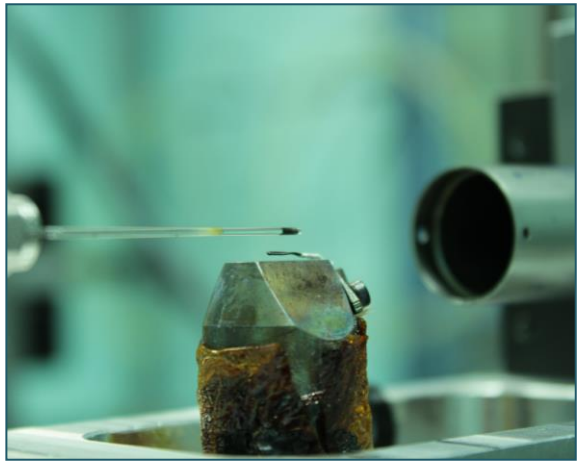
Room temp chamber that can also accommodate for batteries



Cryogenic chamber (10K cryostat)



In-situ flow cells, etc (user supplied)



Capillary gas flow heater

(up to 1000K)

courtesy of Rosalie Hocking, Swinburne University

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Applying for beamtime

A few tips

- The User Portal is your access point.
- Follow our proposal guidelines **<- your proposal success relies heavily on this …**
- Include a sample table (experimental conditions) and justify your time requirement!
- Beamline energy modes – each proposal can only apply for one energy mode:
    - Mode 1: 5 to 9 keV (“titanium to copper”)
    - Mode 2: 9 to 19 keV (“copper to zirconium” and “some L-edges”)
    - Mode 3: 15 to 31 keV (“everything else”)
- If unsure, check feasibility with beamline scientists.
- Bring standards, the more the better!
- An EXAFS scan is about 30 minutes ++, a XANES scan is 15 min ++.
- Our average beamtime is 3 days (9 shifts).

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Applying for beamtime

Australian Synchrotron ...
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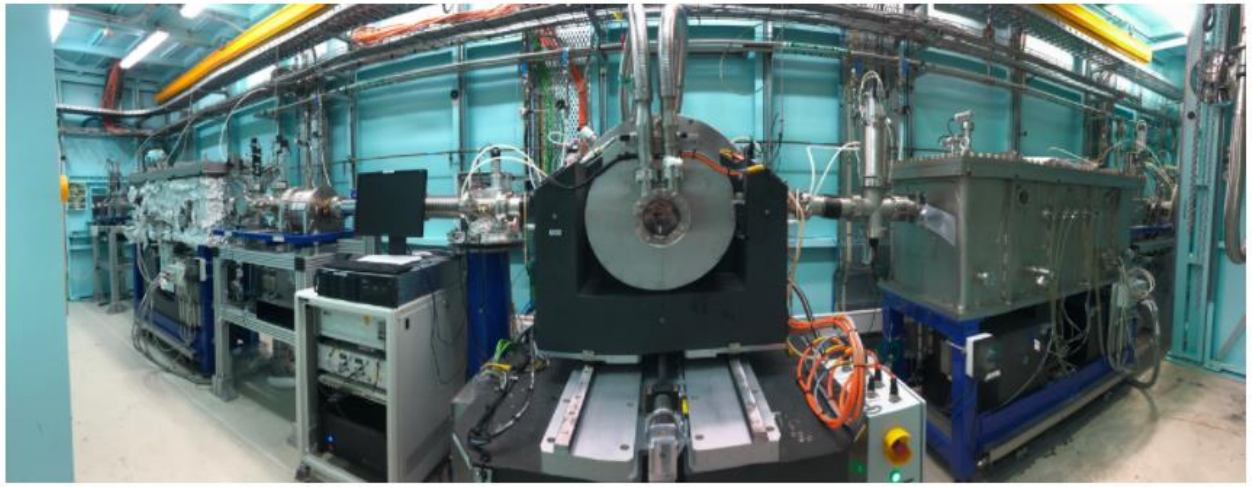
XFM Beamline
MX1 Beamline
MX2 Beamline
THz IR Beamline
IRM Beamline
Our Laboratories
Archived pages

XAS Beamline

Created by IT Support (Unlicensed)
Last updated: Oct 02, 2020 by Spectroscopy Cluster



X-ray Absorption Spectroscopy (XAS) is a versatile tool for chemistry, biology, and materials science. By probing how x-rays are absorbed from core electrons of atoms in a sample, the technique can reveal the local structure around selected atoms.

Technical Information

Find out more about XAS capabilities and sample environments, and get help with experimental design and sample preparation.

Proposal Development

Before submitting a proposal it is important to read our guidelines for the specific information we require. Find the guidelines and other important information here.

Resources

Find links and information regarding accessing your data and the software used at the XAS beamline, including Athena, Artemis, and our in-house software Sakura.

Publications with XAS

Find publications from the XAS beamline, enter your XAS publication details, and find information on how and when to acknowledge the beamline and beamline scientists.

XAS User Manual

Use this link to access the full Beamline Wiki - ***Password required!***

No labels

Beamtime modalities

Onsite
Pre-pandemic nearly every experiment was performed by users coming onsite to conduct their experiment.

Mail-in
Over the past 18 months about 40% of experiments are conducted via mail-in of samples ahead of beamtime. Your assigned beamline scientist will mount, align, scan, troubleshoot, pre-process and curate the data for you. ***This is a far greater time investment and co-authorship is the norm***.

Remote
Looking into the future, also in a post-pandemic (aka pre-carbon neutral) world, we see tools being made available for users to access our beamline experiment controls GUI remotely and in combination with automation improvements.

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Imminent developments (2022)

- **Energy fast scanning**
  Quick measurements < 1 minute per scan, but will likely need several for good EXAFS.
  Ability to follow in-situ measurements more closely.
- **Web-based GUI**
  New controls software with a view to making available for remote access.
- **New fluorescence detector**
  Faster, more reliable, able to absorb more counts/second.
- **New cryostat**
  More ergonomic, more reliable, ability to load multiple sample holders.
- **New beamline vacuum system**
  More reliable beamline (less “clunk” in the night that takes out the beam).
- **Upgrades to our IT/computer and gas supply systems**
  More reliable beamline (less “clunk” in the night that takes out the beam).

Resources list

- Beamline user wiki: https://asuserwiki.atlassian.net/wiki/spaces/UO/pages/22446094/XAS+Beamline
- Proposal guidelines: https://asuserwiki.atlassian.net/wiki/spaces/UO/pages/369459232/XAS+Proposal+Guide
- X-ray Data Booklet order: https://xdb.lbl.gov/
- EXAFS Materials (transmission foils available at XAS): http://exafsmaterials.com/FoilCatalog.html
- CXRO site (X-ray transmission of a solid): https://henke.lbl.gov/optical_constants/
- Proposal portal: https://portal.synchrotron.org.au/index.php/userGroups
- XAFSMass (sample mass required): https://intranet.cells.es/Beamlines/CLAESS/software/xafsmass.html
- Beamline status monitor: http://asweb09.synchrotron.org.au/fsm/index.php
- Online tutorials (data analysis): https://www.diamond.ac.uk/Instruments/Spectroscopy/Techniques/XAS.html

- Your beamline scientists @ as-xas@ansto.gov.au