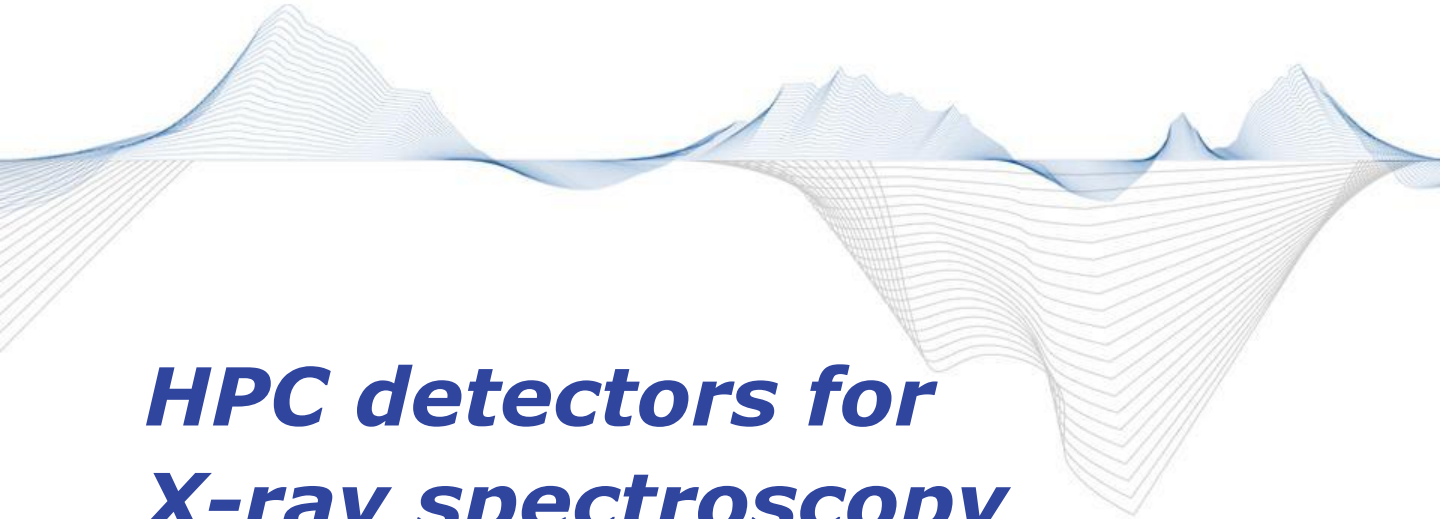
DECTRIS
detecting the future



HPC detectors for X-ray spectroscopy

Dubravka Sisak Jung

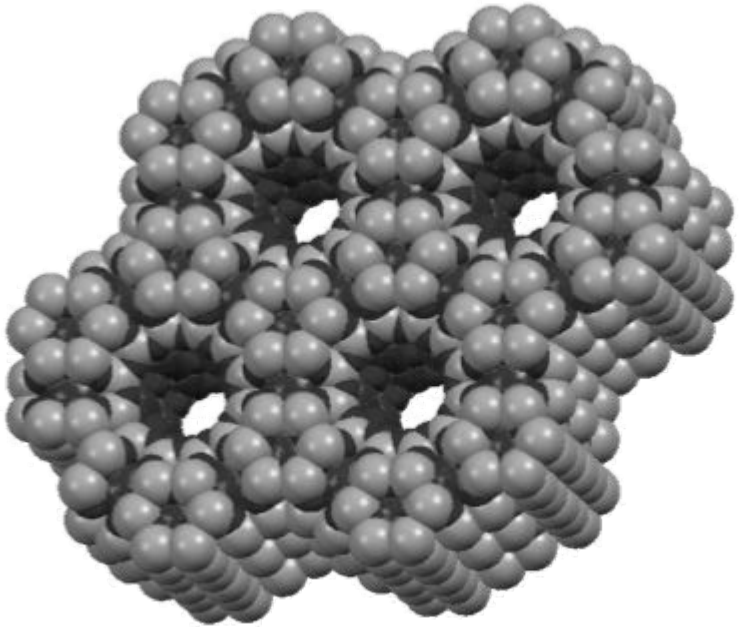
11th of March 2021

DECTRIS Ltd.
5405 Baden-Dättwil
Switzerland
www.dectris.com

X-Ray Spectroscopy - complementary to PXRD

1. **PXRD**
   probing crystal lattices

More on PXRD with EIGER2



DECTRIS detecting the future

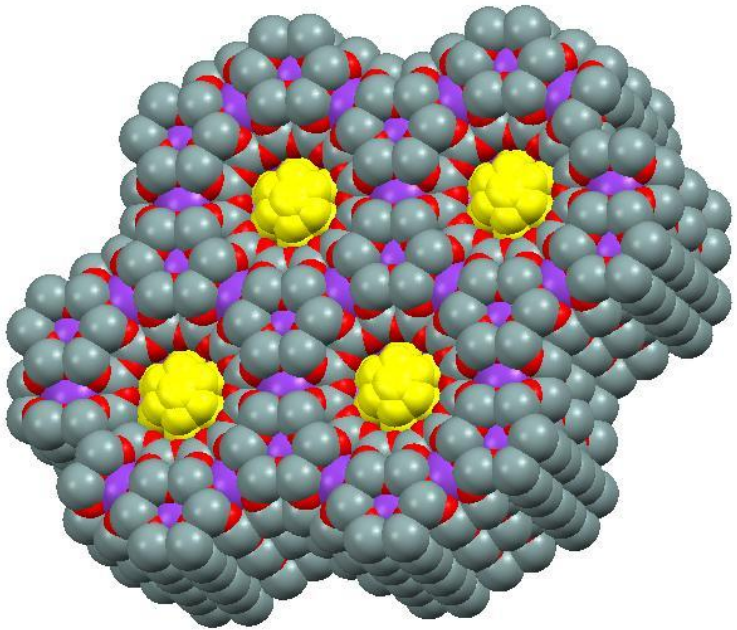
X-Ray Spectroscopy - complementary to PXRD

1. **PXRD**

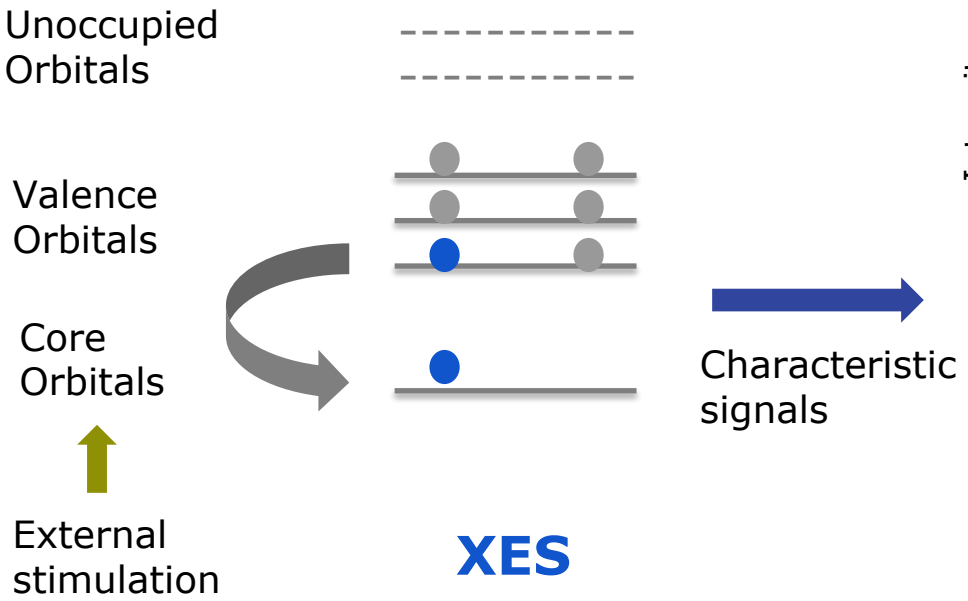
   – *probing crystal lattices*

2. **X-ray Spectroscopy**

   – *A set of techniques used to probe atoms*

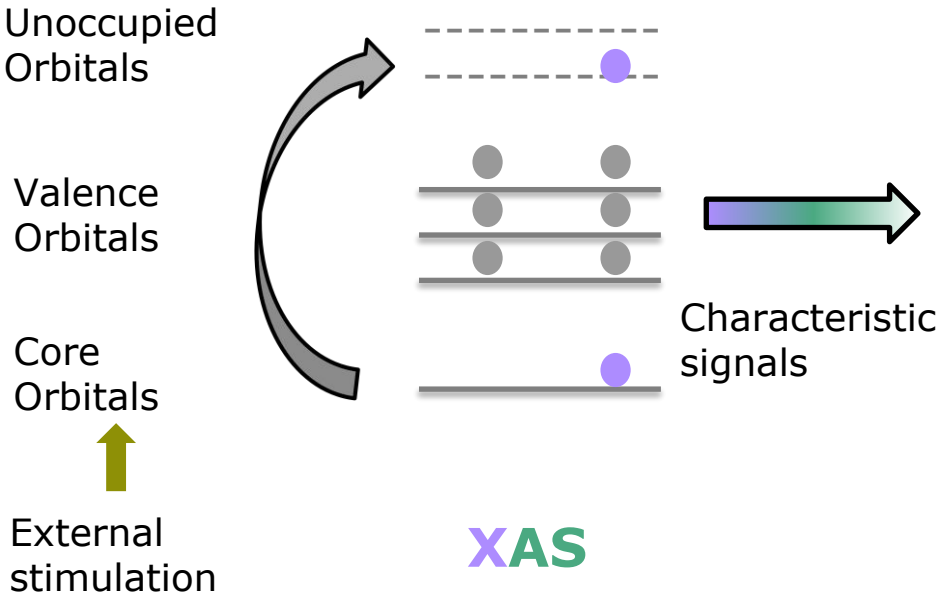


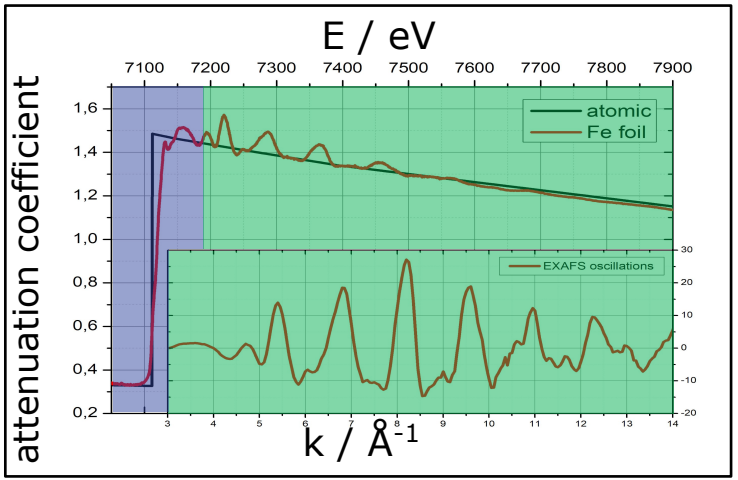
X-Ray Emission Spectroscopy (XES)



Type of atoms
Amount of atoms

X-Ray Absorption Spectroscopy (XAS)



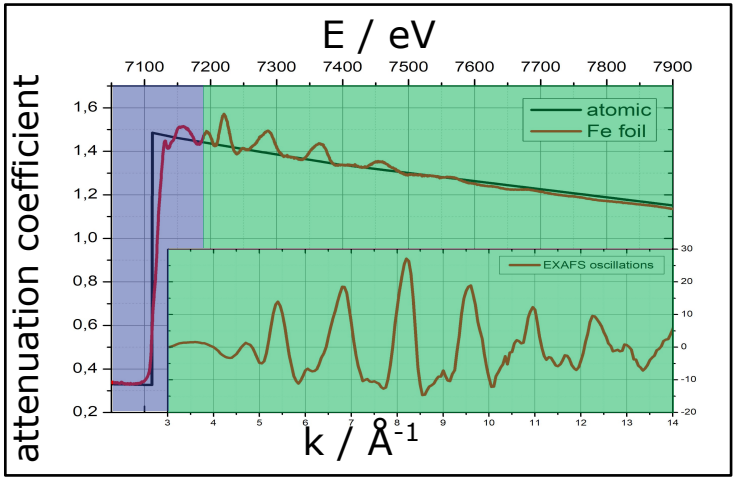


XANES: Oxidation states

EXAFS: Local structure

X-Ray Absorption Spectroscopy (XAS)

More about the topic



XANES: Oxidation states

EXAFS: Local structure

DECTRIS detecting the future

XAS at synchrotron sources

Aim	Detector feature
Collect lots of data in a single shot	Large-area detector
Obtain high-resolution data	Small pixel size
Suppress noise: • Detect low signals • Detect signals at low exposure times • Increase exposure time without increasing noise	Adjustable threshold(s)

XAS at synchrotron sources

Collecting data in challenging conditions:

- Data acquisition down to sub-ms regime
- Spatially-resolved data can be obtained
- Different surfaces and interfaces can be simultaneously studied

More about the topic: see the application note and publication list

XAS: synchrotrons to labs with HPC technology

1. **Why?**

   – *Sample screening prior to synchrotron measurements*

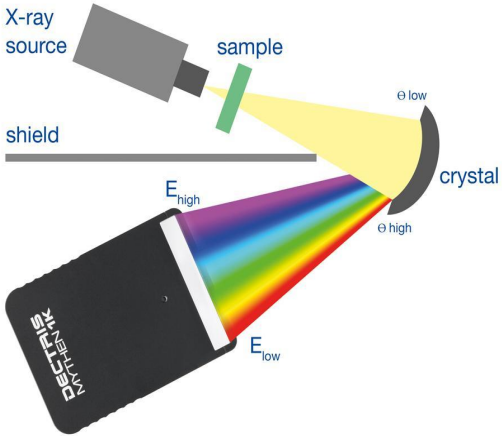
   – *Performing sample analysis in house*

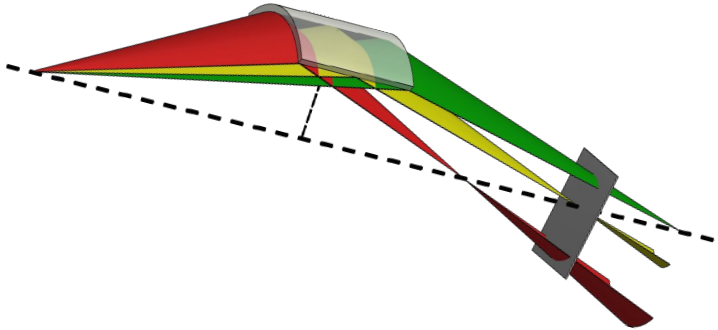
2. **How?**

   – *A dedicated XAS instrument*

   – *An appropriate and affordable detector*

XAS: synchrotrons to labs with HPC technology



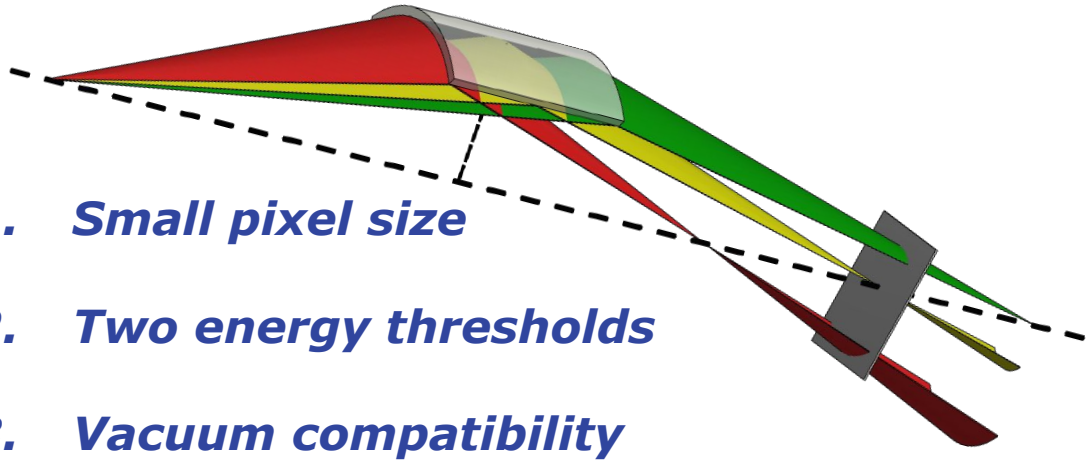


1. XAS-XES lab spectrometer

2. XAS lab spectrometer

[1]Németh, Z. *et al*. (2016) *Rev. Sci. Instrum*. **87**, 103105.
[2]Malzer, W. *et al*. (2018) *Rev. Sci. Instrum*. **89(11)**, 113111

XAS in laboratories with EIGER2 R 500O



1. Small pixel size
2. Two energy thresholds
3. Vacuum compatibility
4. High quantum efficiency

HP Spectroscopy, Dr. Jens Rauschenberger

DECTRIS
detecting the future

More information at
www.dectris.com
or dubravka.sisak@dectris.com

DECTRIS Ltd.
5405 Baden-Dättwil
Switzerland
www.dectris.com

hpspectroscopy

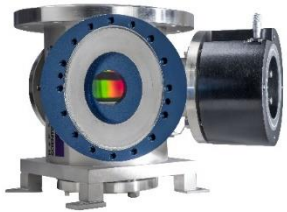
Integrated XAFS solutions by HP Spectroscopy

HP Spectroscopy

- founded 2012, based in Germany
- worldwide distributor base

Generation and measurement of light at vacuum wavelengths and beyond

Spectroscopy



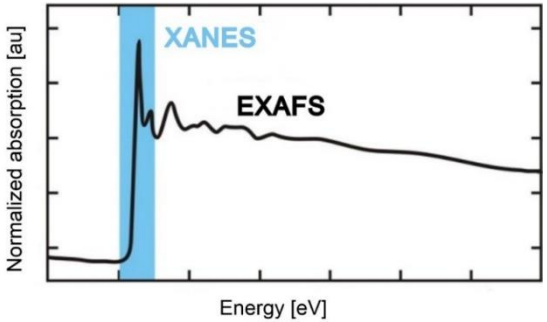
Beamlines

XAS

Sandia National Laboratories · Tel Aviv University · TU Wien Technische Universität Wien · Max Planck Institute for the science of light · Technische Universität München · Fraunhofer IOF · Paul Scherrer Institut PSI · DLR Deutsches Zentrum für Luft- und Raumfahrt · Technion Israel Institute of Technology · MPQ · FORTH Institute of Electronic Structure and Laser · eli beamlines · Friedrich-Schiller-Universität Jena · GSI Helmholtzzentrum für Schwerionenforschung GmbH · ETH Eidgenössische Technische Hochschule Zürich · Los Alamos National Laboratory

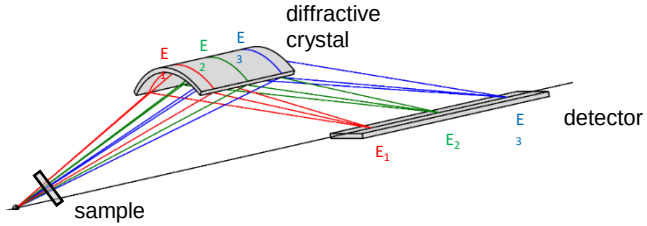
XAFS principle

- XANES
  - electronic configuration
  - oxidation state
- EXAFS
  - atomic distances
  - coordination numbers



Instrumentation

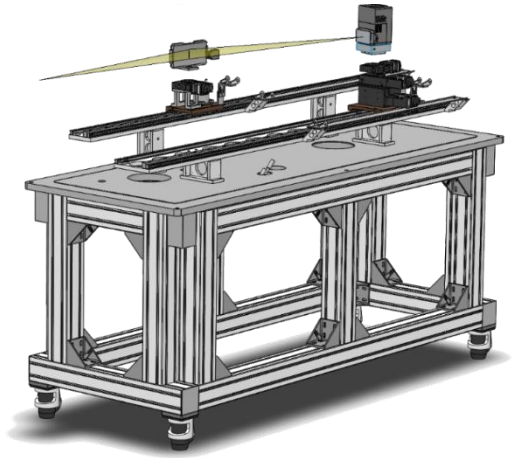
- von Hamos spectrometer
- hybrid detector EIGER2
  - fast polychromatic measurement
  - high signal-to-noise ratio



hiXAS

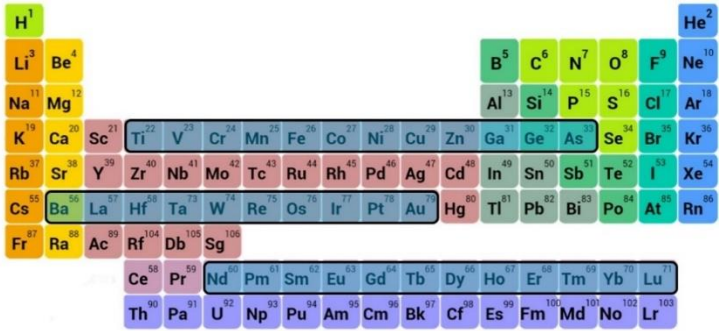
- lab-based turn-key EXAFS and XANES system
- no need to apply for beamtime
- synchrotron-quality spectra

Topology	X-ray tube source von Hamos HAPG spectrometer Dectris EIGER2 R 500K hybrid detector	
Energy range	5-12keV	
	EXAFS mode	XANES mode
Resolving power	1800	4000
	constant over the whole energy range	
Energy bandpass	1000eV	300eV
Footprint	1.0 x 2.0m	1.5 x 3.5m



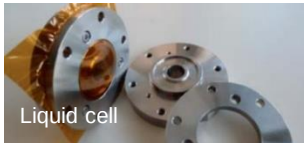
hiXAS

Accessible elemental range

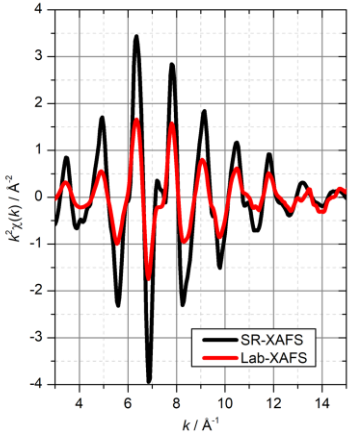


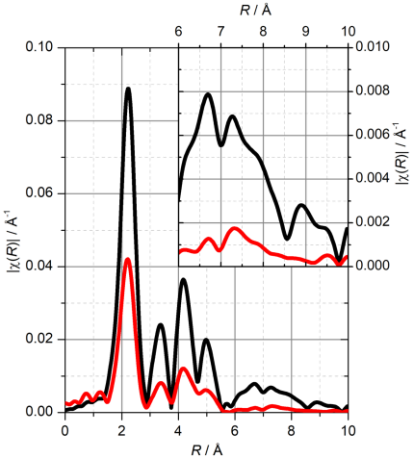
Analyte concentration	a few wt%	
	EXAFS mode	XANES mode
Nominal acquisition time	3min	8min

Sample changer

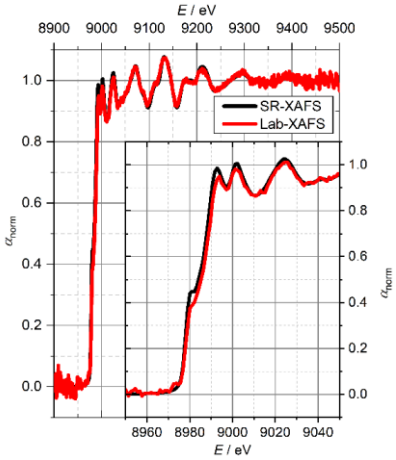


hiXAS – results





EXAFS measurement of a Cu foil
Acquisition time: 3min with sample, 1.5min without sample



XANES measurement of a
10um-thick Cu foil (E/ΔE = 4000)

Measurements on par with synchrotron spectra

Get in touch…

product launch 05/2021

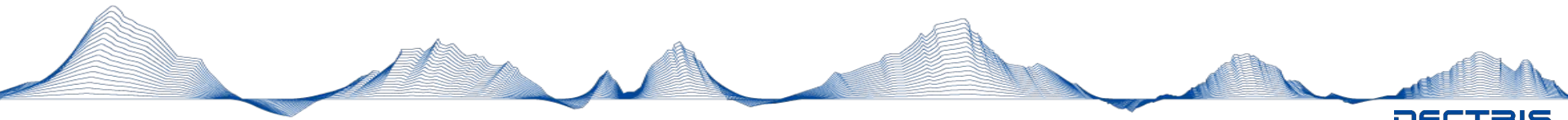
Contact us to discuss your application:

www. hp-spectroscopy.com

email. info@hp-spectroscopy.com

tel. +49 176 209 49 282

Your Questions



IF YOU WANT TO KNOW MORE

Downloads available in the handouts section
(please download before the end of the webinar)

Contact our experts!
(details on slide 2)

Visit dectris.com, bruker.com & hp-spectroscopy.com

Read more about
the new EIGER2 R 250K here
the improved EIGER2 R 500k here

Don't miss DECTRIS latest news!
Sign up for our newsletter here

Upcoming event:

BRUKER
Live from the Lab

When Would You Use 0D, 1D and 2D X-ray Diffraction?
Friday, March 12
9 am CST, 4 pm CET
(Click here for more information)

Thank you for your attention!