# SIGRAY QuantumLeap

X-RAY ABSORPTION SPECTROSCOPY

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QuantumLeap uniquely provides insight into the electronic structure of elements of interest, including their oxidation state and bond lengths.

Chemical State Analysis for Battery and Catalyst Research ... at the Highest Energy Resolution

### **QuantumLeap XAS Advantages at a Glance**

» Synchrotron-like capabilities to analyze electronic (chemical) state of elements » Highest performance XAS for difficult applications including low concentration NMC batteries, lanthanides, and 5d catalysts

» Enables both transmission- and **fluorescence**-mode XAS for bulk to <0.5 wt%



Challenging Samples with QuantumLeap: Low concentration (<2%) Pt catalyst acquired in fluorescence-mode of QuantumLeap. Left: XANES spectra. Right: Analysis of the EXAFS spectrum, showing a first peak Pt-N at 1.7 Å (non-phase shifted) and second and third peaks Pt-Pt bonds.

Patented approach uses an ultrahigh brightness multi-target x-ray source, which provides optimal performance for demanding XAS applications.



## **Finally... Synchrotron XAS Capabilities in Your Lab** Conduct Chemical State Analysis without Needing to Apply for Beamtime

Sigray's QuantumLeap™ product line brings the long-awaited power of x-ray absorption spectroscopy (XAS), a synchrotron technique for determining the electronic structure of elements, to individual laboratories. The system has been rapidly adopted by leading research institutes and companies worldwide for battery and catalyst research.

#### **Culmination of Patented X-ray Innovations**

The QuantumLeap combines multiple patented innovations in x-ray source and system design to deliver the highest quality laboratory results available, with a maximum energy resolving power of  $E/\Delta E > 7000$  and exceptional (high signal-to-noise ratios) EXAFS spectral data.

To ensure users fully maximize the benefits of the system, Sigray provides extensive training on QuantumLeap, including basic training during installation, advanced training with an applications scientist scheduled after a few weeks of operation, and access to a customer portal with videos and articles. Additionally, Sigray hosts an annual on-site workshop for further training and networking with other users.



Synchrotron-quality Results for the Entire Periodic Table of Elements: The Sigray QuantumLeap<sup>™</sup> provides high-quality EXAFS data for almost the entire periodic table of elements with its wide energy coverage from 4.5 to 25 keV. Shown above are Ru K-edge EXAFS spectra acquired around 22 keV.

## QuantumLeap Specifications by Model

Parameter	2050	2100
E/ΔE (Energy Resolution)	>5000*	5000-6000*
Acquisition Modes	Fluorescence <b>or</b> Transmission	Fluorescence <b>and</b> Transmission
Energy Range (keV)	4.5 to 13 keV (Customizable to other ranges if of interest)	4.5 to 25 keV
X-ray Source	Patented long-lifetime x-ray tube with optimized spot geometry	
Target(s)	Rh <b>or</b> W	Rh <b>and</b> W
Max Power	200W	300W
Internal Calibration Targets	Cr, Fe, Cu	
X-ray Detectors	Photon Counting Detector <b>or</b> High-efficiency SDD	Pixelated Photon Counting Detector <b>and</b> High-efficiency SDD
Optimal Focus at Sample	100 $\mu m$ x several mm, depending on slit size	
Enclosure	Steel doors	Transparent leaded glass or acrylic doors Sliding doors for smaller footprint
Training	Basic (during installation) & Advanced Training (1-3 months post-installation) Access to annual Sigray XAS School	
Computers	Linux-based for Motion Control Windows-based Controls & Analysis Workstation	

\*Acquired at approximately 8keV. The resolution can be increased for specific energy ranges through crystal selection and/or through x-ray source power adjustments.

