



AUGUST 2020, ISSUE 86

WELCOME

Thanks to everyone who joined us for the Rigaku Virtual Analytical X-ray Convention earlier this month. It was encouraging to see so many people taking interest in the demonstrations and webinar presentations.

There is still time to register for the upcoming webinar, "Best Operating Practices for XRF Users Including the Importance of Sample Preparation." Originally scheduled for August 19, 2020, it will now run on October 22, 2020. More information and registration information is available [here](#).

In this issue of *The Bridge*, we feature an application report highlighting the new Rigaku ZSX Primus IV tube-below, sequential WDXRF spectrometer with new ZSX Guidance expert system software. The report details the analysis of plant, animal and food samples by standardless FP analysis using scattering X-rays.

Application notes cover industrial forensics in the investigation of unknown sample materials by EDXRF and operando measurements for solid state batteries using transmission geometry.

X-ray imaging systems employing X-ray tomography are presented as the featured products and, as always, the latest materials science news is also included.

UPCOMING RIGAKU EVENTS

<p>SPIE Optics & Photonics August 24&28, 2020 Virtual Event</p>	<p>NGAUS 2020 August 29&31, 2020 Virtual Conference</p>	<p>New England Narcotic Enforcement Officers Association Conference September 9&11, 2020 Newport, RI</p>
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UPCOMING RIGAKU WEBINARS

Best Operating Practices for XRF Users Including the Importance of Sample Preparation

October 22, 9 AM & 2 PM | CDT
Quality Control in industry is imperative, this webinar will highlight the XRF best operating practices that will ensure the daily monitoring and compliance of quality control data. The fundamentals to stable, reproducible analytical results from your XRF spectrometer is not only a stable, working spectrometer, but also a stable, reproducible sample preparation that is appropriate for the material being measured. Choosing an appropriate sample preparation method depends both on the material itself, and on the limitations of the analytical technique with respect to the elements you wish to analyse. During this 1-hour complimentary webinar, specialists from Retsch and Rigaku will present the background to sampling and sample preparation.

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FEATURED PRODUCTS



XRTmicron

Rigaku XRTmicron is a fast, high-resolution laboratory X-ray topography system for non-destructive dislocation imaging. Various types of dislocations and non-uniformity within single crystal wafers (such as Si, SiC, GaN, Ge, GaAs, quartz, sapphire, rutile, calcium fluoride etc.) can be imaged across wafers up to 300 mm in diameter. X-ray topography is a widely used dislocation analysis technique for both research and development and process control by various single crystal, wafer and device manufacturers.

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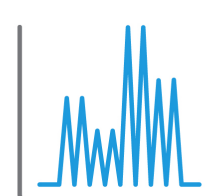


nano3DX

Rigaku nano3DX is a true X-ray microscope (XRM) with the ability to deliver 3D computed tomography (CT) images of relatively large samples at high resolution. This is accomplished by using a high-powered rotating anode X-ray source and a high-resolution CCD detector. The rotating anode provides for fast data acquisition and the ability to switch anode materials easily to optimize contrast for specific sample types.

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FEATURED APPLICATION NOTES



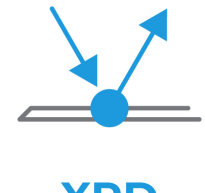
WDXRF

Standardless FP Analysis of Plant, Animal and Food Samples Applying Corrections Using Scattering X-rays

Rigaku Corporation

X-ray fluorescence (XRF) analysis has been widely used for quality or production control in a variety of industries because of its simple sample preparation and high precision/repeatability. Current XRF spectrometers are also capable of analyzing non-routine samples owing to the standardless FP analysis function using fundamental parameter (FP) technology. Progress in the FP method has improved the accuracy of standardless FP analysis in XRF.

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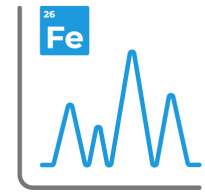
XRD

Operando Transmission XRD Measurement of All-solid-state Lithium-ion Battery Using Ag Source

Rigaku Corporation

All-solid-state batteries that use solid electrolytes are superior to existing lithium ion batteries that use liquid electrolytes in terms of safety, higher capacity, and reduced size. Battery performance is closely related to changes in the crystal phase of the positive electrode material during charge and discharge cycles; therefore, operando measurements using short-wavelength X-rays with high penetration power are being actively conducted.

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EDXRF

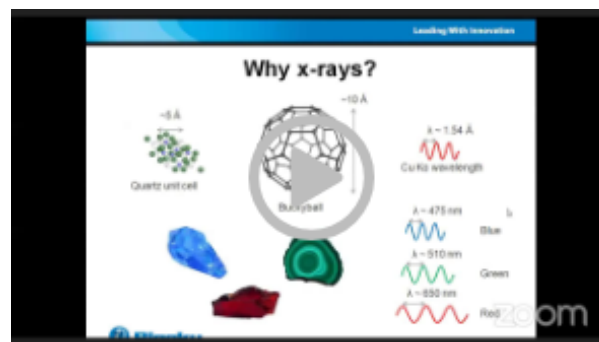
Industrial Forensics

Applied Rigaku Technologies

XRF is an analysis tool used for non-destructive analysis in industrial forensics to identify and resolve manufacturing issues or contamination within the production and distributor processes. Analysis using XRF gives the operator a way to determine elemental composition of foreign material in failure analysis and root cause analysis to optimize quality control and testing procedures.

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FEATURED VIDEO & USEFUL LINK OF THE MONTH



[MakeltFrom.com](#)

ECTMR2020: Elements of X-ray diffraction-Dr. Rakesh Mishra (I. R. Technology Services PVT. LTD. / Rigaku Corp.)

Fundamental and basic techniques of polycrystalline X-ray diffraction.

MakeltFrom.com: Material Properties Database

MakeltFrom.com is a curated database of engineering material properties that emphasizes ease of comparison. It is not a datasheet dump; every listed material is an internationally recognized generic material. The data is sourced from published standards, academic literature, and supplier documentation.

MATERIALS ANALYSIS IN THE NEWS

July 2, 2020: A new National Research Facility (NRF) in [Lab-based X-ray Computed Tomography](#) is set to launch in November this year. The NRF will provide access and support for both academia and industry, embracing both first-time users and more experienced researchers running cutting-edge 3D imaging experiments.

July 25, 2020: Using single crystal X-ray diffraction performed at Princeton University and X-ray pair distribution function measurements performed at the Brookhaven National Laboratory, Princeton Department of Chemistry researchers have [demystified the reasons for creating highly efficient perovskite that has attracted wide attention for its potential in instaling inorganic solar cells](#).

July 27, 2020: X-ray experiments at Berkeley Lab's Advanced Light Source helped scientists to establish that the [parent planetesimal of rare meteorites](#) had a molten core, a solid crust, and a magnetic field similar in strength to the Earth's magnetic field.

July 27, 2020: A team of NUST MISIS scientists, together with colleagues from Russia and Germany, has presented a detailed study of magnetite-gold nanohybrids. In the future, [such nanoparticles can help in theranostics—the diagnostics and subsequent therapy of oncological diseases](#). X-ray phase analysis, transmission electron microscopy and vibromagnetometry were used to examine the nucleation, growth and faceting of magnetite-gold nanohybrids.

July 29, 2020: Over the last eight years, conservationists have been meticulously restoring the [famed altarpiece "The Adoration of the Mystic Lamb,"](#) attributed to Hubert and Jan Van Eyck, housed in St. Bavo's Cathedral in Ghent, Belgium. With the help of several advanced imaging techniques, they have been able to document the changes made over time and identify where overpainting from earlier restorations obscured the original work.

July 31, 2020: Despite recent advances in entropy-stabilized metals and insulating ceramics targeted for structural applications, there is still a shortage of high-entropy semiconductors, which is an obstacle to the adoption of high-entropy materials in semiconducting functional applications. University of Michigan researchers have [utilized entropy to stabilize a new class of semiconducting materials](#).

August 12, 2020: Using X-ray fluorescence, a group of researchers from Charité – Universitätsmedizin, Berlin observed in detail [how different metals are released from joint implants and accumulate in the surrounding bone tissue](#). The study may help optimize materials used and enhance their safety.

August 12, 2020: Graphene, an extremely thin two-dimensional layer of the graphite used in pencils, buckles when cooled while attached to a flat surface, resulting in [beautiful pucker patterns that could benefit the search for novel quantum materials and superconductors](#).

August 14, 2020: To optimize catalyst performance, a team of scientists from [Lawrence Livermore National Laboratory \(LLNL\)](#) and collaborators has developed a detailed understanding of the effect of [pretreatment-induced nanoscale structural and compositional changes on catalyst activity](#) and long-term stability.

August 14, 2020: Recent research published in *Science Advances* [traces the origins of the larger sarsen sandstones, one of two types of stone that make up Stonehenge](#), using portable X-ray fluorescence spectrometry to analyze each of these large boulders. Scientists were able to match the chemical fingerprints of 50 out of 52 sarsens to stones from West Woods, Wiltshire, about 25 km north of Stonehenge.

August 16, 2020: The Louvre Abu Dhabi has joined a global research project to scientifically [scrutinize](#) beneath the surface of Romano-Egyptian funerary portraits. [Painted on wooden boards and placed over the faces of mummies, they are considered to be some of the most spectacular artworks from the ancient world](#). An X-ray fluorescence spectrometer was used to detect and identify most of the chemical elements that lie on the painting's surface.

August 17, 2020: Research led by an ANSTO scientist has found that [the structural degradation of plastic in the ocean facilitates its entry into the natural carbon cycle](#) [efficiently as carbon dioxide](#). Probes with analytical techniques, especially small and wide angle X-ray and Raman scattering, identified important changes to the microstructure.

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