



FEBRUARY 2023, ISSUE 115

WELCOME

I'm sure Texas isn't unique in this aspect, but at this time of year it's not unusual to have the heat on in the house one day and the air-conditioning on the next. Last weekend, for example, we had two nights below freezing and just a few days later the daytime highs were over 80°F (27°C). While much of the continental US is bracing for a snow- and ice storm, we are basking in warmth.

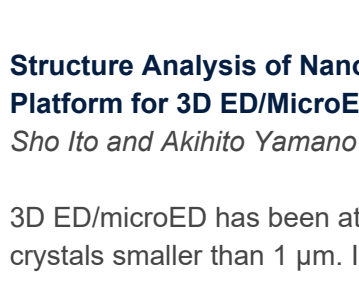
February is also the month when the Winter issue of the Rigaku Journal is published. Below you can find links to the six technical and three new product articles from the latest issue. The technical articles cover a wide range of topics, including structural results from the new XtaLAB Synergy-ED system, a discussion of reconstruction techniques in X-ray computed tomography and advancements in atomic-scale structural analysis using total X-ray scattering profiles, to mention but a few.

The new products section has features about NEX CG II, the newest EDXRF system, new software for Rigaku's thermal analysis systems, and an overview of the imaging platform for preclinical applications produced by Rigaku's newest division, MILabs.

March is the effective beginning of convention season, with two large instrumentation shows taking place. In Europe, there's Forum LABO and in the US there's Pittcon, and Rigaku will be exhibiting at both. We look forward to discussing our latest developments at these two events, as well as celebrating the 50th anniversary of the MiniFlex, the first-ever benchtop XRD system. And, if you are attending the DGK meeting, be sure to take advantage of the tour of our lab in Neu Isenburg.

We are always interested in your feedback about The Bridge. Let us know how we're doing!

RIGAKU JOURNAL



Rigaku Journal
WINTER 2023, VOLUME 39, NO. 1

X-ray diffraction measurement of layered manganese dioxide that can store/release heat repeatedly by desorbing/absorbing water molecules to/from moist air
Norihiko L. Okamoto, Takuya Hatakeyama, Hongyi Li and Tetsu Ichitsubo

We have discovered that layered manganese dioxide (birnessite, $\delta\text{-MnO}_2$) can store/release heat through an intercalation mechanism in which water molecules in a moist atmosphere are deintercalated/intercalated between the layers. The material has been found to have an excellent balance...

[Read more >](#)

Structure Analysis of Nano-Size Crystals by the XtaLAB Synergy-ED: An Integrated Platform for 3D ED/MicroED
Sho Ito and Akihito Yamano

3D ED/microED has been attracting much attention because it enables structure analysis of crystals smaller than 1 μm . In this article, examples of crystal structure analysis and some applications of MicroED/3D ED will be presented.

[Read more >](#)

3D molecular visualization of a human antibody by MAXS measurement reveals significant differences between the solution and crystalline states
Takashi Matsumoto, Akihito Yamano, and Takashi Sato

X-ray solution scattering experiments have been utilized to analyze structures and conformational changes of biological macromolecules. Those experiments employ X-ray scattering data in a small-angle region, a technique called Small Angle X-ray Scattering (SAXS). SAXS experiments often focus on the macroscopic shapes and sizes of molecules.

[Read more >](#)

Atomic-scale structural analysis by total scattering profiles
Masatsugu Yoshimoto

In the past, total scattering data was used to obtain the pair distribution function (PDF) $G(r)$. However, it has become clear that it is also possible to calculate characteristic values related to the physical properties of materials from the total scattering data. In this paper, we introduce two applications using...

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X-ray fluorescence analysis of liquid samples without helium gas
Yuri Maruko

Helium gas is becoming more difficult to obtain these days due to decreased supply and increased demand. In X-ray fluorescence analysis, helium gas is often used in the analysis of liquid samples, while processing samples as solids is possible under a vacuum. In this article we introduce two liquid sample...

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Basics of X-ray CT reconstruction--Principles and applications of iterative reconstruction
Takumi Ohta

This article describes the principles and applications of iterative reconstruction in X-ray computed tomography. We use several real examples to show how iterative reconstruction can produce higher-quality reconstructed images than the conventional reconstruction method. This article describes the principles and applications of iterative reconstruction (IR) methods.

[Read more >](#)

NEX CG II Advanced Cartesian Geometry EDXRF

NEX CG II is a multi-element, multi-purpose energy dispersive X-ray fluorescence (EDXRF) spectrometer that performs rapid qualitative and quantitative trace elemental analyses and addresses needs across many industries. This next-generation, high-end spectrometer is ideal for trace heavy metal and halogen analysis, which is in increasing demand for several sectors.

[Read more >](#)

Vullios - Updated Software Wrapped in a Newly Designed Interface- Thermal Analysis Measurement and Analysis Software

Measurement and analysis software is the crucial interface between the user and an analyzer. Its ease of operation affects how efficiently users achieve their goals. In pursuit of better usability and improved functionality, Rigaku has developed a new measurement and analysis program called "Vullios."

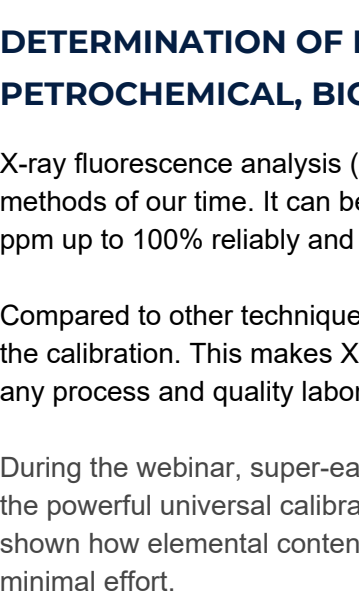
[Read more >](#)

MILabs, All-in-one Imaging Platform for Preclinical Applications- VECTOR®/U-PET/U-SPECT/U-OI/U-CT

MILabs B.V. (Headquarters: The Netherlands, hereinafter MILabs), which joined the Rigaku Group in August 2021, is a leading global manufacturer of preclinical imaging systems. Preclinical research, as the name suggests, is a crucial step in the drug discovery process that usually uses mice and rats in advance of clinical trials...

[Read more >](#)

UPCOMING EVENTS



Rigaku will be exhibiting at **Forum LABO** on **March 28-30, 2023** at Paris Expo Porte de Versailles.

Visit stand **B72** to discover the Rigaku range of equipment and, half a century after the release of the first Rigaku MiniFlex tabletop diffractometer, our latest innovations!

We look forward to discussing (over coffee or tea) your projects and the solutions that can be provided by Rigaku equipment.

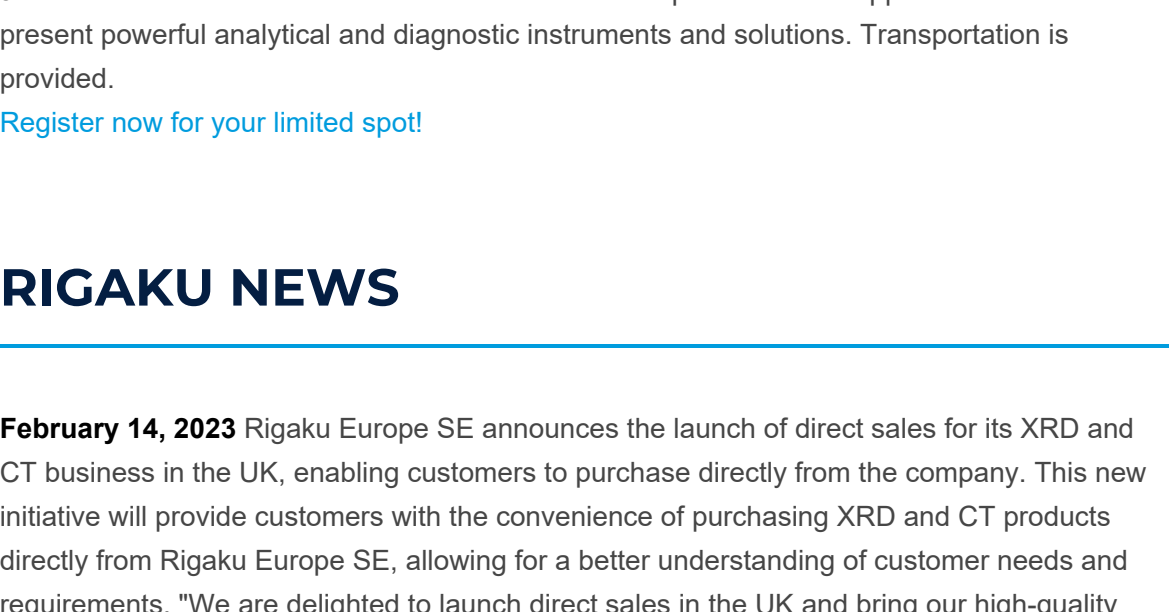


If you are going to be at **Pittcon** (March 18-22), our friendly staff will be on hand at stands **1806** and **1807** to talk all things X-ray analysis and imaging.

We will have on show the Supermini200 benchtop WDXRF as well as the NEX CG II and NEX QC EDXRF spectrometers, complemented by the MiniFlex benchtop XRD, which is celebrating its 50th anniversary.

We look forward to seeing you Philly!

WEBINARS



XRF ANALYTICAL CONSIDERATIONS FOR FUSION METHODS

The Webinar will focus on various applications used to test the quality of a wide range of materials. The most important is the sample preparation of the various types of materials to obtain accurate and precise results.

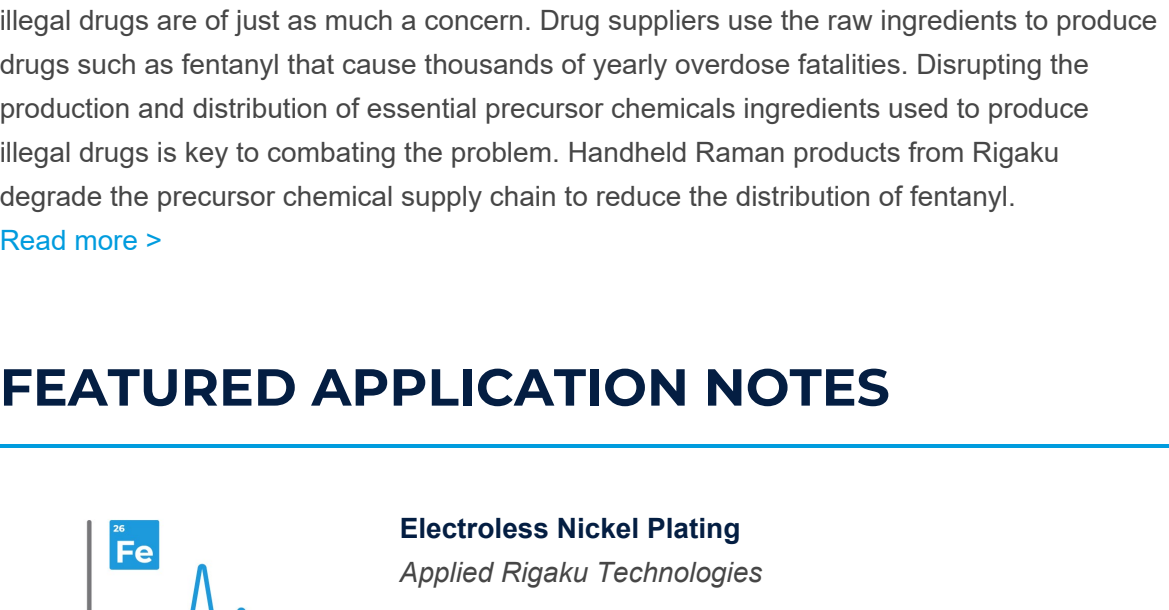
The analysis of powders by XRF the sample inhomogeneity due to segregation, grain size, mineralogical effects influence the intensity and cause errors. Fusion is a benefit in that the matrix and mineralogy is destroyed. The fusion method means the laboratory only require one calibration method for the analysis of a wide range of elements. The analytical considerations are discussed when setting up the analytical method.

Date/time

Wednesday, Mar 15, 2023 09:00 AM CET

Wednesday, Mar 15, 2023 04:00 PM CET

[Register >](#)



DETERMINATION OF ELEMENT CONCENTRATIONS IN PETROCHEMICAL, BIODIESEL SAMPLES USING XRF METHOD

X-ray fluorescence analysis (XRF) is one of the most important instrumental analytical methods of our time. It can be used to analyze element concentrations in the range of a few ppm up to 100% reliably and quickly.

Compared to other techniques, XRF saves time not only on sample preparation but also on the calibration. This makes XRF a super-powerful technique that should not be overlooked in any process and quality laboratory.

During the webinar, super-easy sample preparation—including the solidification method and the powerful universal calibration—will be presented. Using examples from the field, it will be shown how elemental contents can be determined quickly and precisely using XRF with minimal effort.

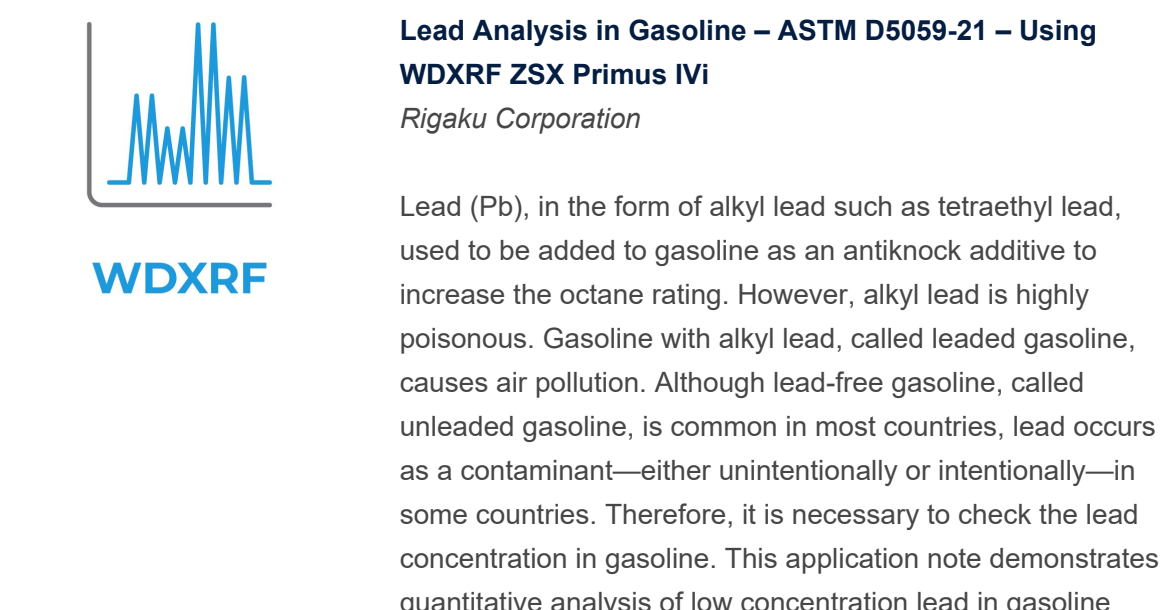
Date/time

Thursday, March 23, 2023, 09:00 AM CET

Thursday, March 23, 2023, 04:00 PM CET

[Register >](#)

RIGAKU LAB TOUR DURING DGK



The annual meeting of the DGK will take place in Frankfurt from March 28 to 30, 2023—a stone's throw away of RESE's state-of-the-art laboratories in Neu-Isenburg—giving you the perfect opportunity to experience Rigaku's products and scientists on site and in effect. Join us in an exclusive all-access lab tour and watch up close as our application scientists present powerful analytical and diagnostic instruments and solutions. Transportation is provided.

[Register now for your limited spot!](#)

RIGAKU NEWS

February 14, 2023 Rigaku Europe SE announces the launch of direct sales for its XRD and CT business in the UK, enabling customers to purchase directly from the company. This new initiative will provide customers with the convenience of purchasing XRD and CT products directly from Rigaku Europe SE, allowing for a better understanding of customer needs and requirements. "We are delighted to launch direct sales in the UK and bring our high-quality XRD and CT products directly to customers," said Dr. Michael Hipper, Managing Director, Rigaku Europe SE. "This new initiative represents our commitment to providing the best possible customer experience and ensuring that our products are accessible to everyone."

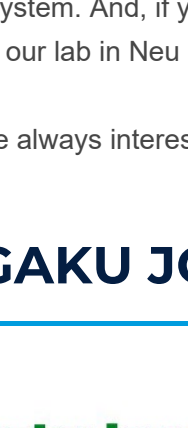
With this new direct sales channel, customers will have access to state-of-the-art instruments through the local representative Omar Matar, regional Sales Manager UK, Rigaku Europe SE. Matar will now manage the direct sales and support of the XRD and CT business in the UK.

MATERIALS ANALYSIS IN THE NEWS

February 8, 2023 - Every day, millions of kilograms of illicit substances make their way around the world and into various countries, including the United States. Yet it's not just the end product that raises concern; the raw ingredients needed to produce the vast amounts of illegal drugs are of just as much a concern. Drug suppliers use the raw ingredients to produce drugs such as fentanyl that cause thousands of yearly overdose fatalities. Disrupting the production and distribution of essential precursor chemicals ingredients used to produce illegal drugs is key to combating the problem. Handheld Raman products from Rigaku degrade the precursor chemical supply chain to reduce the distribution of fentanyl.

[Read more >](#)

FEATURED APPLICATION NOTES

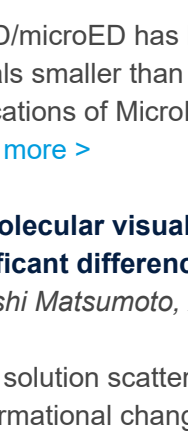


Electroless Nickel Plating

Applied Rigaku Technologies

Electroless nickel plating (EN) deposits a nickel-phosphorus or nickel-boron coating, providing an even, protective coating on metal or plastic materials for wear, corrosion resistance, or cosmetic enhancement. Measurement and control of the elements in the plating bath and deposited coating are important for optimum product quality. To meet this industry need, Applied Rigaku Technologies offers the **NEX DE VS** benchtop EDXRF system. Easy to operate at-line or in the lab, the **NEX DE VS** uses a special fundamental parameters application method that automatically calculates the plated coating thickness and composition and measures liquids using simple empirical calibration. **NEX DE VS** automatic switching collimators also offer small spot measurements down to 1 mm spot size for measuring plating on smaller pieces.

[Read More >](#)

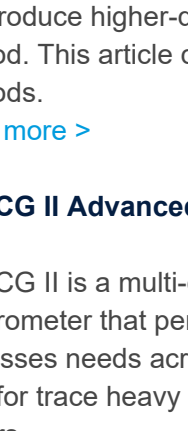


Twist width evaluation of group III-V nitride films by rocking curve measurement

Rigaku Corporation

Deep ultraviolet LEDs are preferable for wide use as an alternative to mercury lamps since they are ultraviolet sources with low environmental impact. In recent years, their sterilization function has been especially attracting great attention, and practical application of this function is expected soon. In order to increase light emission efficiency and carrier lifetime, the quality of the AlN layer, which is the base for the active layer, must be improved. In this measurement example, an appropriate evaluation method was examined for the crystal orientation distribution (twist width) in the in-plane direction, which is used as an indicator of the threading edge dislocation density of the AlN layer.

[Read more >](#)



Lead Analysis in Gasoline – ASTM D5059-21 – Using WDXRF ZSX Primus IVi

Rigaku Corporation

Lead (Pb), in the form of alkyl lead such as tetraethyl lead, used to be added to gasoline as an antiknock additive to increase the octane rating. However, alkyl lead is highly poisonous. Gasoline with alkyl lead, called leaded gasoline, causes air pollution. Although lead-free gasoline, called unleaded gasoline, is common in most countries, lead occurs as a contaminant—either unintentionally or intentionally—in some countries. Therefore, it is necessary to check the lead concentration in gasoline. This application note demonstrates quantitative analysis of low concentration lead in gasoline according to ASTM D5059-21 on Rigaku **ZSX Primus IVi**, a wavelength dispersive X-ray fluorescence (WDXRF) spectrometer.

[Read more >](#)