



JANUARY 2024, ISSUE 125

WELCOME

What were the top science stories in 2023? The fact that it was the hottest year on record should be at the top of any list, leading to wildfires and floods and other climate-related catastrophes, with 2024 possibly being even hotter, but the news wasn't all grim. Spacecraft from a variety of countries are making it to the moon again. Government scientists used lasers to demonstrate nuclear fusion. Gene editing therapy is being used to treat sickle cell disease. Researchers reconstructed a Pink Floyd song entirely from someone's brain waves.

Rigaku participated in the analysis of samples returned from the asteroid Benu. The OSIRIS-Rex probe landed in the Utah desert last September bearing about 250 grams of rock and dust. The Rigaku Application Laboratory Thermal Analysis Group used a thermogravimetry-differential-thermal-analysis/gas-chromatography—mass-spectrometry (TG-DTA/GC-MS) system to measure the amount of water and carbon contained in the specimen. The 4.5-billion-year-old asteroid existed before Earth did, so it could hold clues about how our planet formed and which building blocks of life meteorites delivered here long ago.

AI was a hot topic last year, with researchers looking for new ways to make use of machine learning and other related concepts after the release of ChatGPT at the end of 2022. Who knows what innovations will arise out of this technology? It has been used to predict the folded 3D structure of a protein molecule based on its amino-acid sequence. One fascinating example used AI to forecast the nocturnal flight patterns of birds. That seems like an abstract study, but it has real-world applications—it can help city officials determine when to turn off building lights to prevent bird strikes. The use of AI was also a central topic of discussion during last year's writers' and actors' contract negotiations.

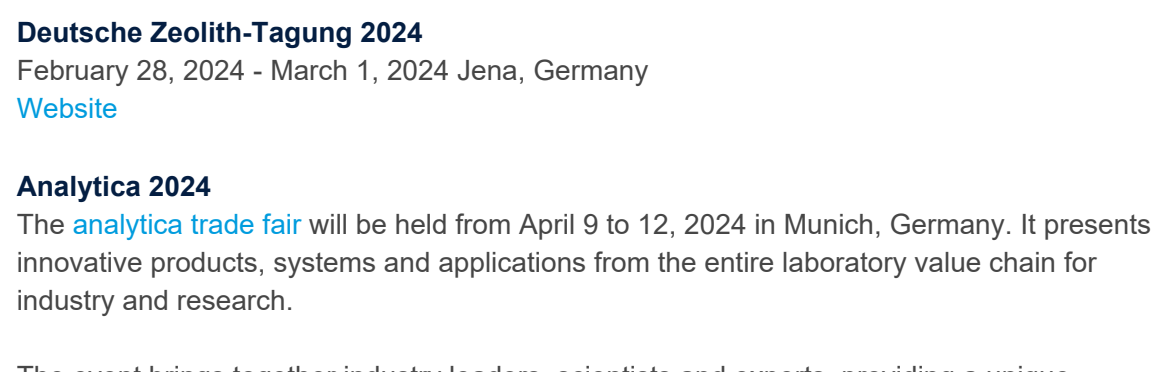
Symmetry plays an important part in diffraction, so it was with interest that we read about the discovery by mathematicians of a polygon (called an "einstein," or "one stone") [that could be used to tile a floor, but only makes non-repeating patterns](#). It's the kind of thing M.C. Escher would have enjoyed.

We hope to visit with you at the many events listed below. Please check out the podcasts, webinars and other material contained in this issue of The Bridge and let us know if there are any topics you'd like us to cover in future issues.

UPCOMING EVENTS

Webinar: Pair Distribution Function (PDF) Analysis for Everyday Battery Analysis
February 21, 2024 Webinar
[Register](#)

TSM - Texas Society for Microscopy 2024
February 22, 2024 - February 24, 2024 San Marcos, TX
[Website](#)



Pittcon 2024
February 24 - February 28, 2024 San Diego, CA
[Website](#)

SPIE Advanced Lithography + Patterning
February 25, 2024 - February 29, 2024 San Jose, CA, United States
[Website](#)

Anwendertreff Steinfurt
February 27, 2024 - February 28, 2024 Steinfurt, Germany

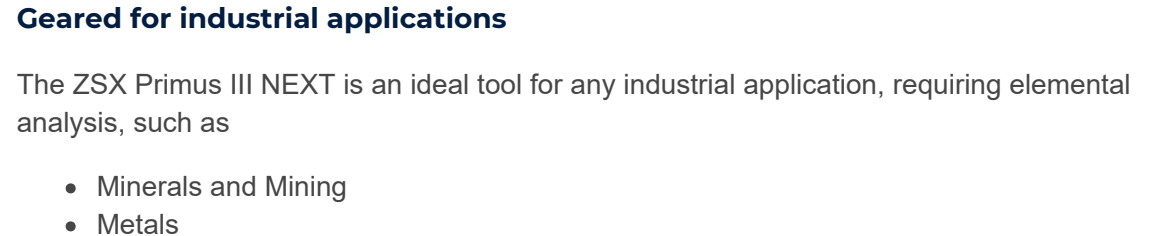
Deutsche Zeolith-Tagung 2024
February 28, 2024 - March 1, 2024 Jena, Germany
[Website](#)

Analytica 2024
The [analytica trade fair](#) will be held from April 9 to 12, 2024 in Munich, Germany. It presents innovative products, systems and applications from the entire laboratory value chain for industry and research.

The event brings together industry leaders, scientists and experts, providing a unique networking opportunity. The analytica conference, featuring world premieres and product highlights, allows attendees to interact with the scientific elite and explore the latest analytical findings.

Visitors can look forward to exploring Rigaku's innovative products, systems and applications, contributing to the event's comprehensive market overview.
[Website](#)

ANALYSIS IN THE SPOTLIGHT



ZSX Primus III NEXT
Elemental analysis of solid samples

Tube-Above Sequential Wavelength Dispersive X-ray Fluorescence Spectrometer For Industrial Applications

Rigaku ZSX Primus III NEXT delivers rapid elemental industrial quality control by quantitative determination of major and minor elements from Be through Cm for powder and solid samples.

This new scanning wavelength dispersive X-ray fluorescence spectrometer features Rigaku's unique X-ray tube-above configuration and is built upon the successful ZSX Primus series platform.

Geared for industrial applications

The ZSX Primus III NEXT is an ideal tool for any industrial application, requiring elemental analysis, such as

- Minerals and Mining
- Metals
- Cement
- Ceramics and Refractories
- Glass Manufacturing
- Petrochemicals
- Chemicals
- Environment

Turnkey application packages

Industry-specific application packages are available. The "Pre-Calibration Package," which stores calibration curves at the time of shipment, the "Calibration Package," which includes standard samples and analysis conditions, and the "Master Matching Library" for standardless analysis (SQX) which is specialized for certain types of products, are available to help users start up the analysis operations.

Easy application sharing

The ZSX Primus III NEXT, ZSX Primus IV, and ZSX Primus Ivi share the same hardware and software platform, making it easy to share applications between spectrometers.

Improved quality of analytical results

Have confidence in each analysis result. Measurement statistics and spectrometer physical parameters can be displayed with each analysis result to easily spot irregularities.

ZSX Primus III NEXT - your ideal partner for fast and reliable production control in highly demanding industrial environments.
[Read more >](#)

[Read more >](#)

IN THE NEWS

December 5, 2023: Rigaku Analytical Devices announces it is the recipient of a 2023 'ASTORS' Homeland Security Award from American Security Today (AST) for its [CQL Max-ID handheld 1064 nm Raman analyzer](#) in the CBRNE Detection category.

January 18, 2024: Spectroscopic data suggest that thin films of a certain semiconducting material can exhibit altermagnetism, a new and fundamental form of magnetism. Materials that exhibit this phenomenon are predicted to have no net magnetization and an electronic band structure that is split into spin-up and spin-down bands, giving these materials properties of both antiferromagnets and ferromagnets. [Evidence to support the existence of altermagnetic materials has now been found by researchers at Seoul National University](#). They say that the distinctive properties of altermagnets could be useful for spin-based electronics.

January 25, 2024: Lithium-ion batteries face safety concerns as a result of internal separator issues that often lead to short circuits. Scientists have now developed [a method to improve the stability and properties of separators with a layer of silicon dioxide and other functional molecules](#). Batteries employing these separators demonstrated improved performance and reduced growth of disruptive root-like structures, paving the way for high-safety batteries that can aid the adoption of electric vehicles and advanced energy storage systems.

January 25, 2024: SAPS Destroys illicit drugs worth R90-million (~\$5M USD) in Cape Town, South Africa.

January 26, 2024: A study by Rice University researchers found that [graphene derived from metallurgical coke](#), a coal-based product, could serve not only as a reinforcing additive in cement but also as a replacement for sand in concrete. The graphene-based concrete not only matches the mechanical properties of standard concrete but also offers a higher strength-to-weight ratio.

January 30, 2024: An international team has developed [a new method to make and manipulate a widely studied class of high-temperature superconductors](#). Because of its unique properties, the new superconductor is a promising candidate for the world's first high-temperature, superconducting diode, essentially a switch that controls the flow of electrical current, the researchers said.

WEBINARS



BENEATH THE SURFACE: X-RAY ANALYSES OF BATTERY MATERIALS AND STRUCTURES
A Battery Research Series by Rigaku
Pair Distribution Function (PDF) Analysis for Everyday Battery Analysis
February 21, 2024 at 1:00 PM
[REGISTER NOW](#)

Did you know in operando measurements of the X-ray scattering Pair Distribution Function (PDF) can help you see the changes in the local order/disorder within cathode and anode materials?

In the charge/discharge cycling of lithium-ion batteries (and other novel battery technologies), there is a continuous buildup of local disorder in the cathode and anode materials driven by the Li-ion mobility that will eventually contribute to battery failure and reduced operational lifetime.

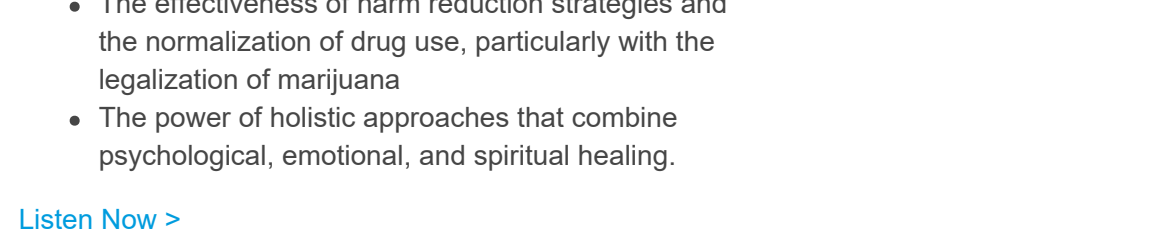
Characterization of the nature and extent of this local disorder can lead to predictive insights into battery failure mechanisms.

In operando measurements of the X-ray scattering PDF can allow direct modeling of the changes in the local order/disorder within the cathode and anode material as well as for solid electrolytes if used.

In the webinar, we will investigate how best to collect in operando PDF data and discuss the optimum data processing approaches to give meaningful results. In particular, the use of Reverse Monte Carlo techniques to give physical representations of the locally disordered structure will be presented.

Date/time
Wednesday, February 21, 2024 - 13:00 CST
[Register >](#)

FEATURED APPLICATION NOTE



Ultra Carry® Trace Element Analysis For PPB-level Aqueous Samples
Applied Rigaku Technologies

Trace element analysis of aqueous solutions is important in many areas, such as industrial manufacturing effluents, quality control (QC) and quality assurance (QA) processes, environmental monitoring and remediation, agriculture, and general research. To meet the challenges of trace analysis into the ppb range, Rigaku offers the [NEX CG II EDXRF analyzer](#) and the [Ultra Carry sample preparation disk](#). With the Rigaku system, trace analysis can be carried out by non-technical operators and experts without special scientific training and costly, complicated, time-consuming sample preparation. Typical detection limits for analyzing aqueous samples using Ultra Carry are demonstrated using the NEX CG II EDXRF analyzer.
[Read More >](#)

FEATURED ARTICLES



Combating fentanyl in US will mean working with Mexico, China | NewsNation Now
Michael Brown, a former U.S. Drug Enforcement Administration (DEA) senior special agent told NewsNation that [for the country to curb fentanyl deaths and overdoses, cooperation with China and Mexico will be essential](#).

The Growing Narco-Terrorism Threat to the Homeland
Article in [Defense Opinion](#) by Michael Brown

Weaponized Pharmaceutical Compounds are a Clear and Present Danger
Article in [CBNW Magazine](#) by Dr. Jeff Brodeur

PODCASTS

The Opioid Matrix is a podcast for anyone looking for the latest information in the illegal drug supply chain—beginning to end. Each episode will feature a discussion with industry experts about the current opioid crisis, including drug trafficking, drug manufacturing, drug identification, drug addiction, as well as the role of government, law enforcement, new health and social programs, and more.
[Listen to New Episodes >](#)

Mental Health Resilience: Strategies for Combating Addiction with Gina Tabrizy

Exploring the intricate web of trauma's influence, addiction's grasp, and the erosion of genuine connections, this episode unearths the need for holistic healing, emotional empowerment, and a renewed focus on nurturing our youth's mental well-being.

[Gina Tabrizy](#), our latest guest, is an inspirational keynote speaker, author of [Healing is a Love Story](#), radio host of [The Recovery Show](#), and a trauma/addiction expert. She is currently the Chief Clinical Liaison at [Sierra by the Sea](#), an adult residential treatment facility. Gina has a zeal for providing excellent clinical care with a high success rate. Join us as we discuss:

- The connection between trauma and addiction, particularly prevalent in affluent neighborhoods where electronic devices replace genuine family connections
- The effectiveness of harm reduction strategies and the normalization of drug use, particularly with the legalization of marijuana
- The power of holistic approaches that combine psychological, emotional, and spiritual healing.

[Listen Now >](#)

The Battery Lab is a podcast empowering the researchers powering the future. Every episode features insights from the industry experts, leading academics and cutting-edge research advancing batteries — and society — to the next level of safety and efficiency. From raw materials to analysis to state-of-the-art designs, if you care about fueling the future, you've come to the right place. Welcome to the Battery Lab!
[Listen to New Episodes >](#)

Understanding Semiconductors: Modern Metrology from Lab to Fab, is a podcast for engineering leaders in characterization, metrology, process, and analytics, looking for discussion around semiconductor metrology challenges. Each episode will feature a conversation with technology experts about problems facing the semiconductor metrology industry.
[Listen to New Episodes >](#)

[Subscribe to Rigaku newsletters!](#)

