Rigaku

橋 THE BRIDGE

MATERIALS ANALYSIS
eNEWSLETTER

May 2023, ISSUE 118

WELCOME

Rigaku manufactures a variety of analytical instruments that use X-rays to determine the composition and structure of materials. Our technologies include general and single crystal X-ray diffraction, wavelength dispersive and energy dispersive X-ray fluorescence, transmission X-ray fluorescence, X-ray reflectometry, small- and wide-angle X-ray scattering and much more.

One application where many of these technologies intersect is in the field of semiconductor metrology, where sophisticated instruments are used to determine the thickness, composition, roughness, density, porosity, and crystal structure of thin films deposited on the surface of semiconductor wafers as well as to locate any defects or contaminants. In support of our semiconductor metrology tools clients, Rigaku recently opened its first Semiconductor Metrology Technology Center in Sunnyvale, CA, making these tools more accessible to the American semiconductor market. It will also facilitate closer working relationships between Rigaku and their clients, facilitating development of next-generation solutions.

During June, Rigaku is hosting a Semiconductor Forum for semiconductor professionals, experts, researchers, and enthusiasts in Neu-Isenburg, Germany, near the headquarters of Rigaku Europe SE. This two-day hybrid event will bring together scientists, engineers, and users of semiconductor metrology to develop more efficient solutions. Read more about the Forum below.

In this issue of *The Bridge*, we also highlight the popular CT Lab HX benchtop micro CT scanner, share our recent news about a prestigious award given to our latest mercury analysis instrument, and provide links to a number of industry-related news items.

2023 SEMICONDUCTOR FORUM

Rigaku
2023
SEMICONDUCTOR
FORUM
PRESENTED BY RIGAKU EUROPE SE
AND RIGAKU SEMICONDUCTOR METROLOGY DIVISION
June 20-21, 2023 | Frankfurt, Germany
HYBRID EVENT
RIGAKU.COM

JOIN US FOR A HYBRID EVENT

THE 2023 RIGAKU SEMICONDUCTOR FORUM

June 20-21, 2023
In-person Frankfurt, Germany, and Zoom Events online.

Rigaku Semiconductor Forum 2023 is an event for semiconductor professionals, experts, researchers, and enthusiasts. The Forum provides a platform for participants to share their knowledge, ideas, and experiences and discuss various techniques and solutions to semiconductor manufacturing and research challenges.

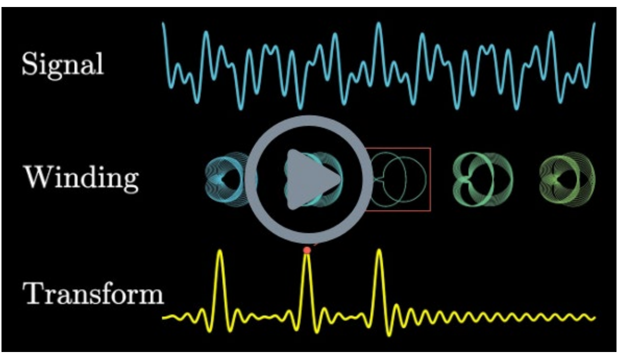
It is an excellent opportunity to bring together scientists, engineers, and users of semiconductor metrology to develop more efficient solutions.

Whether you're looking to expand your knowledge, network with other industry professionals, or keep abreast of the latest trends and developments, Semiconductor Forum 2023 is the place to be.

REGISTER

Do you have any questions or comments?
Please contact rsmd@rigaku.com for more details.

VIDEO OF THE MONTH



But what is the Fourier Transform? A visual introduction.

3blue1brown, or 3b1b for short, is some combination of math and entertainment, depending on your disposition. The goal is for explanations to be driven by animations, and for difficult problems to be made simple with changes in perspective.

Topics tend to fall into one of two categories:

- Those people might be seeking out, like linear algebra, neural networks, calculus, Fourier transforms, quantum mechanics, etc.
- Problems in math which many people may not have heard of, and which seem quite challenging at first, but where some shift in perspective makes it both doable and beautiful.

Go to website >

FEATURED PRODUCT

What is CT Lab HX?

Rigaku CT Lab HX is a benchtop micro CT (computed tomography) scanner. The adjustable SOD (source-to-object distance) and SDD (source-to-detector distance) make this benchtop micro CT scanner flexible. It covers from 2.1 um voxel resolution in the high-resolution mode and 200 mm FOV (field of view) in the large FOV mode. The CT Lab HX is equipped with a 130 kV - 39 W high power X-ray source. The X-ray source settings and X-ray filters are adjustable to optimize the X-ray energy to various sample materials and sizes.

How do I achieve high resolution?

Rigaku CT Lab HX uses the cone-beam geometry. This geometry uses the X-ray beam divergence to magnify the sample image. The magnification factor is determined by the ratio of SOD (source-to-object distance) and SDD (source-to-detector distance). So to achieve high resolution, you can increase the SDD and/or decrease SOD. CT Lab HX has the flexibility to do them both in its compact design.
With the long SDD and short SOD settings, you can achieve 2.1 um voxel resolution (~ 5 um spatial resolution) on the CT Lab HX. This resolution can reveal micro cracks, voids, fibers in composites, etc.

How do I achieve 200 mm FOV?

The FOV (field of view) you can cover in one scan is limited by the size of the detector. However, the offset scan mode doubles the effective detector width to cover a wide FOV without having to change the detector. Rigaku CT Lab HX utilizes this scan mode to achieve 200 mm FOV without having to change the detector or compromising its compact system size.

The 200 mm FOV enables a scan of an entire smartphone, 3D printed objects, fruits, etc.
Learn more>

RIGAKU NEWS

Nippon Instruments Fully Automated Mercury Measuring Instrument Receives Excellence Award at 2023 Environmental Awards

May 11, 2023 – Nippon Instruments Corporation (hereafter “NIC,” president: Isao Hamanaka), a subsidiary of Rigaku Holdings Corporation, has received a prestigious award for excellence at the 50th Environmental Award ceremony for their fully automated mercury measuring instrument, which is designed with consideration for environmental impact and economic efficiency.

Fully automated mercury measuring instruments “RA-4500” (left) and “RA-7000” (right)

Mercury has been a familiar substance throughout the history of human development. While mercury is found in natural resources and minerals, its toxicity means it is regarded as a pollutant. The Minamata Convention on Mercury, which came into effect in 2017, promotes efforts to regulate emissions and releases of mercury and prevent the spread of health hazards on an international scale. NIC has focused on the importance of making it possible for “anyone to easily and accurately measure mercury,” and has been developing and providing instruments that fully automate all necessary operations.
Read more >

FEATURED APPLICATION NOTES

EDXRF

Co, Br, Mn in TPA and PTA
Applied Rigaku Technologies

Terephthalic acid (TPA) and purified terephthalic acid (PTA) are precursors in making polyester PET for polyester films, PET bottle resin, textile fabrics, and specialty chemicals. During production and use of TPA and PTA, the Co, Br, and Mn catalysts must be closely monitored to ensure optimum product quality. Since TPA and PTA are aggressive solutions, an on-line measurement is ideal. Continuous monitoring minimizes lab testing requirements, allows for process optimization, and is critical in ensuring the end product meets specifications. The Rigaku NEX OL offers a simple and low maintenance on-line analytical technique for trending your process streams.
Read More >

XRF

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

Organic compounds are the main components in plant, animal and food samples. Since it is difficult to accurately analyze the major elements of organics (i.e., C, H, O and N) by XRF, an organic compound is set as the balance component in standardless FP analysis of these materials. However, since only a single compound can be set as the balance component, the chemical composition of the organic compounds must be different from that of the balance component, which causes analysis error. This application note demonstrates analysis results from plant, animal and food samples by standardless FP analysis with the SQX Scatter FP Method.
Read More >

XRF

Lubricating Oil Analysis by Benchtop WDXRF According to ASTM D6443-14
Rigaku Corporation

Lubricating oils are given specific functional properties by mixing additives with base oil. In order to assure consistent and desirable performance, it is very important to control the concentrations of the additives during the lubricant manufacturing process. This application note demonstrates the capability of Supermini200, a low-cost, compact benchtop WDXRF spectrometer, for quantitative elemental analysis of Ca, Cl, Cu, Mg, P, S and Zn in base oils, lubricating oils and additives according to ASTM D6443-14.
Read More >

50th MiniFlex ANNIVERSARY

SINCE 1973
50 YEARS AND COUNTING
MiniFlex
SEND A HAPPY BIRTHDAY VIDEO MESSAGE TO RIGAKU.COM/MINIFLEX50

Since its introduction, the MiniFlex has consistently evolved and continually sets the standard with new innovations, despite the imitators that have come along over the years. This is a testament to the dedication of Rigaku's R&D team and their response to customer feedback and commitment to innovation.

Share your stories with your fellow MiniFlex users from around the world!
You can upload a photograph or a video message from your phone or computer. It will be displayed on the Rigaku website and the Rigaku YouTube channel.

Visit the MiniFlex Anniversary page>

IN THE NEWS

May 22, 2023: Scientists at Argonne National Laboratory and Lawrence Berkeley National Laboratory have developed a new electrolyte for lithium-ion batteries. The safer electrolyte can work just as well in sub-zero temperatures as it does around room temperature, or 68 to 77 degrees Fahrenheit.

May 22, 2023: In an attempt to solve two environmental problems at once, researchers at the University of Kitakyushu in Japan have found that shredded diapers can be used to replace between 9 and 40% of the sand used in making concrete without reducing its strength. The diaper-infused concrete was used to build a small house in Indonesia, to demonstrate how this type of waste could be diverted from landfills to build more affordable housing in low- and middle-income communities.

May 22, 2023: A team has developed a first-of-its-kind, breakthrough method that makes it easier to create high-quality metal oxide thin films out of "stubborn" metals that have historically been difficult to synthesize in an atomically precise manner. They found that incorporating a concept called "epitaxial strain"— effectively stretching the metals at the atomic level—significantly simplifies the oxidation process of these stubborn metals. This research paves the way for scientists to develop better materials for various next-generation applications including quantum computing, microelectronics, sensors, and energy catalysis.

May 24, 2023: Scientists claim to have made significant advancements in the production of low-carbon compounds derived from coal, which could yield substantial economic benefits, and have far-reaching implications for the country's energy and resource security. The research has centered on olefins—also known as alkenes—a class of chemical compounds that serve as important raw materials in the production of various industrial products such as plastics, pharmaceuticals, cosmetics, and even spacecraft.

May 26, 2023: Scientists from the RIKEN Center for Emergent Matter Science and colleagues have successfully developed a "superlattice" of semiconductor quantum dots that can function similarly to a metal. The new material's conductivity was found to be one million times greater than existing quantum dot displays, while the quantum confinement of individual dots remained. The team predicts significant improvements in quantum dot superlattice capabilities and potential new applications like true all-QD direct electroluminescence devices, electrically driven lasers, thermoelectric devices, and highly sensitive detectors and sensors.

PODCASTS

The
OPIOID
MATRIX
A Journey Into the Rabbit Hole
Rigaku

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 >

UNDERSTANDING
SEMICONDUCTORS
Rigaku

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 >

Rigaku
THE
BATTERY
LAB

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 >

THE
PHARMA LAB
SHOW
Rigaku

The Pharma Lab Show is a podcast exploring the technologies, analysis, and innovation that goes into bringing the pharmaceuticals that allow humanity to live longer, fuller, healthier lives.
Each episode features interviews with industry leaders and experts who share how they are working tirelessly to bring these life-changing products into the world.

Listen to New Episodes >

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