



MAY 2020, ISSUE 83

WELCOME

Rigaku is pleased to introduce our new e-learning training course. In addition to the existing XRD training courses, a single crystal X-ray structure analysis (SCX) course is now available. The aim of the course is to provide practical knowledge on how to perform X-ray crystallography experiments. The key technical points of single crystal X-ray structure analysis will be described in detail. [Click here](#) to preview the course.

Rigaku e-learning provides an online training course via the Internet. Users can study anywhere and at any time using an Internet browser on a PC. A training course consists of easy-to-follow slides, narrations, voice texts and quizzes that the user can study thoroughly. Furthermore, users can repeat the training course throughout the contract period. Please visit our [website](#) for more information.

UPCOMING RIGAKU EVENTS

ISPE Biopharmaceutical Manufacturing Conference
Online Event
June 1-3, 2020

BioTaiwan
Online Event
July 22-26, 2020

Rigaku's Virtual Analytical X-ray Convention
Online Event
August 4-6, 2020

[VIEW MORE](#)

UPCOMING RIGAKU WEBINARS



TOPIQ | The Advantages of Indirect Excitation EDXRF

June 11, 10 AM | CDT
The Rigaku EDXRF product line is introduced and the NEX CG is featured using indirect excitation. The basic ideas of direct and indirect excitation for optimum excitation and background removal are reviewed. Rigaku innovation brings NEX CG to the forefront of EDXRF analysis using full 90° Cartesian geometry and polarization, allowing pure monochromatic excitation with virtually all background removed. This allows for optimum use of Fundamental Parameters without the need for any reference materials. Rigaku's unique Scattering FP determines the complex balance of the material that cannot be measured directly by X-rays.

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FEATURED JOURNALS & REPORTS



Journals

PDF Analysis Using X-ray Total Scattering

By Masatsugu Yoshimoto & Yuji Shiramata, Rigaku Corporation

In recent years, Pair Distribution Function (PDF) analysis has been used to characterize material structure in a wide research field. H. Kim reported the reduction mechanism in the reversible hydrogen storage capacity of $V_{1-x}Ti_x$ alloys. B. Li et al., reported the mechanisms of the thermoelectric effect and the phase transition to superionic conductor of $AgCrSe$, which is known to be a thermoelectric material at high temperature, by X-ray and neutron total scattering, and inelastic neutron scattering.

[Read More >](#)

FEATURED PRODUCTS



NANOPIX mini

Rigaku NANOPIX mini is the world's first benchtop small-angle X-ray scattering (SAXS) system that is engineered to deliver automatic nanoparticle size distribution analysis for both quality control and research and development applications. Nanoparticle size, size distribution, and particle shape are the key pieces of information obtained from SAXS.

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Progeny ResQ

The Rigaku Progeny ResQ 1064 nm handheld Raman analyzer provides emergency responders, law enforcement agencies and the military with the industry's most comprehensive tool for chemical threat identification, CBRNe detection, and narcotics classification in a fast and simple handheld form.

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FEATURED APPLICATION NOTES



XRD

Variable Humidity Measurement of a Drug Substance Using XRD-DSC and a Humidity Controller

Rigaku Corporation

Some of the compounds that make up pharmaceuticals take water into the crystal structure and change to hydrates with humidification. There is a correlation between crystal structure and physical properties, so it is important to understand the phase transition behavior due to changes in humidity when controlling the quality of hydrates. By measuring the XRD of a crystal powder while humidifying, the structural changes associated with humidification can be examined.

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XRF

Semi-quantitative Analysis of Glass Raw Material with Supermini200

Rigaku Corporation

Since glass is a unique material in that it has both the properties of being physically hard and optically transparent, it is used in an extremely wide range of application from products used in daily life to high-tech fields such as aerospace development. The major component of glass is silica (SiO_2), and other components contained in glass can directly impact its characteristics. For example, Na_2O can lower glasses' softening temperature, but excessive amount can deteriorate its physical and chemical durability.

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EDXRF

Analysis of Alloy Powders for Metal 3D Printing

Applied Rigaku Technologies

DMLS (Direct Metal Laser Sintering) is an industrial metal 3D printing method that fuses layers of fine metal powder particles, creating a metal part layer by layer. Metal 3D printing techniques are ideal for manufacturing complex metal shapes that can be expensive or impossible to produce using traditional manufacturing methods. Metal 3D printed parts are typically stronger and denser than those made by traditional casting. The DMLS process is used for prototyping metals parts and low volume manufacturing, eliminating expensive and time-consuming tooling.

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X-ray Imaging

Observation of Milk Protein Aggregation in String Cheese

Rigaku Corporation

In food science, observing the internal structure of materials in one of the basic methods to explore the factors determining texture and taste. An electron microscope, such as SEM or TEM, is often used to observe the internal structure, so the images are often deformed or contaminated. An X-ray microscope can observe the internal structure without destroying the sample. A Cu source is especially appropriate for visualizing the internal structure with high contrast, even for foods composed of light elements.

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FEATURED VIDEO & USEFUL LINK OF THE MONTH



Bone Breakthrough May Lead to Aerospace Advances

For decades, scientists studying osteoporosis have used X-ray imaging to analyze the structure of bones and pinpoint strong and weak spots. Cornell researchers used a 3D printer to manufacture bone-inspired material made from a urethane methacrylate polymer and then tested its durability.

Knovel®

Knovel Material Property Search

The Knovel material property search engine finds numeric data hidden in handbooks, manuals and databases. There are thousands of materials and substances (metals, polymers, ceramics, chemicals, etc.) and more than 100 properties (physical, thermodynamic, electrical, corrosion, toxicity, etc.) to search.

MATERIALS ANALYSIS IN THE NEWS

April 14, 2020: An international team of scientists has created [carbon nanolatrices constructed from dense-cell plate-architectures](#) that are stronger than diamonds as a ratio of strength to density.

April 20, 2020: To address plastic pollution plaguing the world's seas and waterways, Cornell University chemists have developed a [new polymer that can degrade by ultraviolet radiation](#), according to research published in the *Journal of the American Chemical Society*.

April 22, 2020: New research from North Carolina State University finds that [radiation detectors making use of single crystal gallium oxide](#) allow for monitoring X-ray radiation in near-real time. The researchers found that there was a linear increase in current passing out of the gallium oxide relative to the level of X-ray exposure. In other words, the higher the level of X-ray radiation exposure, the higher the increase in current from the gallium oxide.

April 27, 2020: The United States Army has a [new type of multi-polymer filament for commonly used desktop 3D printers](#). This advance may save money and facilitate fast printing of critical parts at the point of need.

April 28, 2020: [Neutron imaging, a powerful nondestructive testing \(NDT\) method](#), can see through complex materials and catch flaws and defects that would otherwise go unnoticed, such as cracks and voids in energetic materials, ceramic remnants in turbine blades and structural weaknesses in composites and 3D-printed components.

April 28, 2020: Rutgers University engineers have created a [highly effective way to paint complex 3D-printed objects](#), such as lightweight frames for aircraft and biomedical stents that could save manufacturers time and money and provide new opportunities to create "smart skins" for printed parts.

April 27, 2020: An international team of scientists that includes researchers from ITMO University has developed a [new light-emitting composite material based on perovskite nanocrystals](#), with air and water resilient optical characteristics, for the purpose of creating miniature light sources with improved output capacity.

April 29, 2020: A Purdue University-led research team has found a [way to make halide perovskites stable enough by inhibiting the ion movement that makes them rapidly degrade](#), unlocking their use for solar panels as well as electronic devices. The discovery also means that halide perovskites can stack together to form heterostructures that would allow a device to perform more functions.

April 30, 2020: Scientists in the [University of Maryland, A. James Clark School of Engineering](#) have [reinvented a 26,000-year-old manufacturing process](#) into an innovative approach to fabricate ceramic materials that has promising applications for solid-state batteries, fuel cells, 3D printing technologies and beyond.

May 1, 2020: Twenty-first century X-ray technology has [allowed scientists to peer back through time at the production of the armor worn by the crew of Henry VIII's warship](#), the Mary Rose. X-ray analysis of artefacts from the warship sheds new light on their construction and conservation. The team included Emeritus Prof Mark Dowsett, his partners in Ghent and used XRD facilities in the Warwick RTP as well as the XMaS beamline.

May 13, 2020: A new study proposes a [microscopy type of optical imaging for realizing the X-ray imaging of atomic nuclei \(ANXRI\)](#) by integrating aberration-corrected scanning transmission electron microscopy (STEM), the bremsstrahlung generation of X-ray photons, and the EDS receiving and mapping of the photons. ANXRI successfully images atomic nuclei in three different types of materials, including nanoporous gold (NPG) coated with Pd and Pt, NPG without Pd or Pt, and SrTiO₃.

May 15, 2020: A [new research facility that could provide a major boost to innovation in materials science](#) research across the U.K. is being launched by scientists at the University of Sheffield. The new laboratory—the first of its kind in the U.K.—will explore how materials can be improved to benefit energy industries and boost Britain's post-COVID-19 recovery.

May 18, 2020: A [new way of creating carbon fibers](#)—which are typically expensive to make—could one day lead to using these lightweight, high-strength materials to improve safety and reduce the cost of producing cars, according to a team of researchers. Using a mix of computer simulations and laboratory experiments, the team found that adding small amounts of the 2D graphene to the production process both reduces the production cost and strengthens the fibers.

May 18, 2020: Far below the Earth's surface, about 1,800 miles deep, lies a rolling magmatic core sandwiched between the solid silicate-based mantle and molten iron-rich core. The region-mantle boundary. [Learning how liquid silicates behave at these extreme temperatures and pressures](#) has been a longstanding challenge in the geosciences.

May 18, 2020: Tantalum disulfide is a mysterious material. According to textbook theory, it should be a conducting metal, but in the real world it acts like an insulator. Using a scanning tunneling microscope, researchers from the RIKEN Center for Emergent Matter Science have taken a high-resolution look at the structure of the material, [revealing why it demonstrates this unintuitive behavior](#).

May 19, 2020: An international team of researchers were able to get a novel material to increase the frequency of a terahertz radiation flash by a factor of seven: [a first step for potential IT applications](#).

May 19, 2020: Researchers have discovered a new kind of rubber and catalyst that together can be used with low energy consumption to make flexible, repairable, sustainable objects, including car tires. The new rubber material, made from cheap and plentiful industrial waste products sulfur, canola cooking oil and dicyclopentadiene (DCPD)—from petroleum refining, can be [completely repaired and returned to its original strength in minutes](#)—even at room temperature—with an amine catalyst.

May 19, 2020: Scientists have discovered that [the transport of electronic charge in a metallic superconductor containing strontium, ruthenium and oxygen breaks the rotational symmetry of the underlying crystal lattice](#). Scientists previously observed this peculiar behavior—characterized by electrons preferentially traveling along one direction, decoupled from the host crystal structure—in other materials whose ability to conduct electricity without energy loss cannot be explained by standard theoretical frameworks.

May 19, 2020: A significant chunk of the world's history is facing an existential threat. U.S. government deeds, recordings of Indigenous Australians and photographs of English seaside life spanning three decades are just some of the historical documents recorded on acetate film that are [suffering irreversible damage due to what's known as vinegar syndrome](#).

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