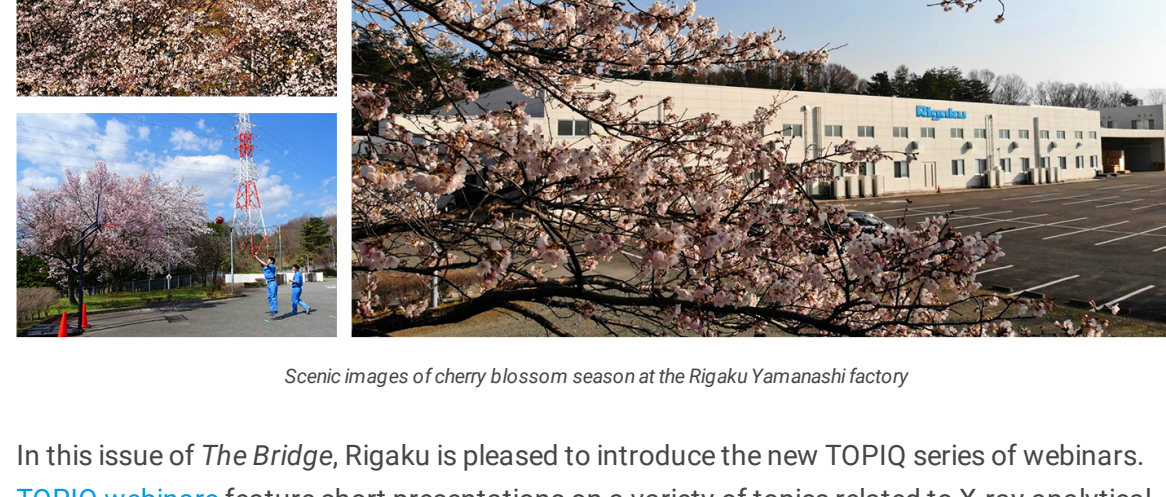




APRIL 2020, ISSUE B2

## WELCOME

COVID-19 poses an unprecedented challenge to all of us. The uncertainty that we all share for our future, immediate and long-term, gives us little comfort. [Read a statement from Rigaku Corporation President and CEO, Hikaru Shimura.](#)



Scenic images of cherry blossom season at the Rigaku Yamanaishi factory

In this issue of *The Bridge*, Rigaku is pleased to introduce the new TOPIQ series of webinars. **TOPIQ webinars** feature short presentations on a variety of topics related to X-ray analytical techniques and applications throughout the coming months. We will also be presenting a series of ten tuition-free 1-hour webinars in June on practical aspects of X-ray crystallography.

Please join us today at 1 PM CDT for the next episode of the webinar series "X-ray Computed Tomography for Materials & Life Science." We have covered the basics of X-ray Computed Tomography (CT) and some materials science applications in the series so far. Dr. Angela Criswell has recently joined our X-ray imaging team as a biochemist and will introduce X-ray CT applications for Life Science. She will show you how you can prepare live plant samples for X-ray CT and analyze root systems and features such as cell-wall thicknesses and void distribution of different seed varieties.

[REGISTER NOW](#)

## UPCOMING RIGAKU WEBINARS



Tomato plant root system

### X-ray Computed Tomography for Materials and Life Science 5: Plant Science Applications

April 29, 1 PM | CDT

A number of X-ray CT application examples for plants and seeds will be discussed. Examples to include the non-destructive characterization of plant traits for ripening fruit, seeds, and root systems. Additionally, analysis of cell wall thicknesses and void distribution among different seed varieties will be presented.

[Read More >](#)

## TOPIQ

QUICK WEBINARS BY RIGAKU

### TOPIQ | Best operating practices for XRF users

May 5, 10 AM | CEST

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 webinar will focus on how to ensure the XRF method is fit for purpose.

[Read More >](#)

### TOPIQ | New Applications for Material Analysis with the Rigaku Progeny 1064 nm Raman

May 7, 2 PM | CEST

Handheld Raman technology was mainstreamed nearly a decade ago in the pharmaceutical industry. So, what's new to share you may wonder? In this webinar, we will take some time to talk about the evolution of portable technologies and their use in the pharmaceutical industry over the past few decades, from early use in the security industry to the most recent competitive developments. Join us to learn about what 1064 nm Raman technology can do best, focusing on applications developed on the Rigaku Progeny 1064 nm handheld Raman analyzer.

[Read More >](#)

### TOPIQ | Thin Film XRD application by Rigaku SmartLab

Two sessions:

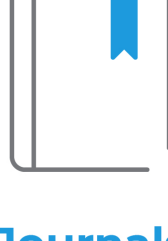
May 19, 10 AM and 5 PM | CEST

The new SmartLab® multipurpose X-ray diffractometer for various thin-film applications will be presented. The key optical components required for high-quality XRD measurements together with the unique in-plane/out-of-plane goniometer will be discussed. The usage of the non-coplanar condition (superposition of out-of-plane and in-plane arms) for high quality large range pole figures and in-plane residual stress measurements will be shown. Examples of fast and wide range reciprocal space maps and high quality rocking curves obtained by combining SmartLab with the HyPix-3000 area detector are included in this webinar.

[Read More >](#)

[VIEW MORE](#)

## FEATURED JOURNALS & REPORTS



### Journals

#### Cement Analysis by XRD

By Atsushi Ohbuchi, Rigaku Americas Corporation & Takahiro Kuzumaki, Rigaku Corporation

Cement is used as a raw material in the construction of buildings, tunnels, dams, and bridges. Basically, cement consists of clinker, calcium sulfate hydrate as a plaster component, aggregate, and water. The hardening process of cement proceeds by a hydration reaction of components in cement, and some hydrate components ettringite (AFt,  $3CaO \cdot Al_2O_3 \cdot 3CaSO_4 \cdot 32H_2O$ ), monosulfate (AFm,  $3CaO \cdot Al_2O_3 \cdot CaSO_4 \cdot 12H_2O$ ), and C-S-H— are formed.

[Read More >](#)

## FEATURED PRODUCTS



### 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.

[Read More >](#)



### CT Lab HX

The CT Lab HX is a high-performance benchtop X-ray micro CT system with the most powerful X-ray source in its class (130 kV, 39W). This compact, yet powerful, micro CT imaging system can provide three dimensional X-ray image of a wide variety of samples such as printed circuit boards (PCBs), batteries, food, drugs, medical device, bones, minerals, ceramics and light metals.

[Read More >](#)

## FEATURED APPLICATION NOTES



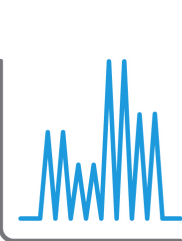
### XRD

#### Simultaneous Operando XRD Measurement for Positive and Negative Electrode Materials in a Laminate Cell Using Transmissions Geometry

Rigaku Corporation

Because of their high energy and power densities, lithium-ion batteries have been used as power sources for portable electronic devices such as laptop computers and mobile phones. To characterize the battery, X-ray diffraction is frequently used. Operando XRD measurement, which provides the crystal structure change of the positive and negative electrode materials in the battery during the charge-discharge process, gives important information about the battery, such as reaction state, deterioration characteristics and structural details.

[Read More >](#)



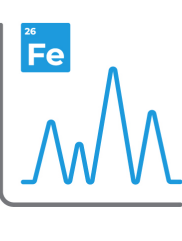
### XRF

#### Multiple Element Determination of Nickel Sulfide Ores by the Pressed Powder Method on SimultixIS

Rigaku Corporation

Nickel is an essential base metal in modern industries. About 60% of nickel is used to make stainless steel. In recent years, the market price of nickel metal and the volume of production of primary nickel and ore have been increasing. Therefore, the demand in laboratories for accurate and fast analysis to determine multiple metal elements in ores is growing.

[Read More >](#)



### EDXRF

#### Academia & Teaching

Applied Rigaku Technologies

XRF has become a popular analytical technique in industry around the world, as well as in academia for teaching and basic research. The technique is simple, fast and non-destructive. Use Rigaku EDXRF systems from Applied Rigaku Technologies in Austin, Texas, in such disciplines as chemistry, material sciences, physics and geology. Rigaku EDXRF systems are also valuable tools in basic research for elemental spectroscopic analysis as well as industrial process control.

[Read More >](#)

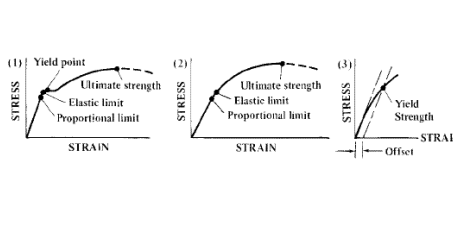
## FEATURED VIDEO & USEFUL LINK OF THE MONTH



### Rigaku Progeny 1064 nm Raman as a Versatile Solution for Raw Material ID and Verification

Learn how the Rigaku Progeny 1064 nm Handheld Raman offers the proven robustness required of high-throughput raw materials testing while being uniquely versatile enough to provide you the scientific answers you need in more experimental applications. Hear about how Progeny fits into your data integrity and compliance solution puzzle, and learn more about interesting applications like Polymorph speciation and cell culture media analysis.

View more of our upcoming TOPIQ webinars [here!](#)



### Strength of Materials

Put together by Engineers Edge, this site contains basic definitions and equations used to calculate the strength of materials, as well as an extensive list of links to other relevant sites.

## MATERIALS ANALYSIS IN THE NEWS

**March 26, 2020:** New research conducted in part at the U.S. Department of Energy's Brookhaven National Laboratory may bring a whole new class of chemical elements into a materials science balancing act for designing alloys for aviation and other applications.

**April 8, 2020:** Using a combination of experimental and computational data, researchers discover paths to optimize pulses from highly intense X-ray beams. One potential method of seeing the structure of a single, free-form molecule at atomic resolution involves aiming extremely short, highly intense X-ray free-electron laser (XFEL) pulses at a sample material.

**April 9, 2020:** Researchers of the Structural Engineering Laboratory, Department of Architecture and Civil Engineering, Toyohashi University of Technology have developed a new concept for strengthening steel in critical building structures using bond-free carbon fiber reinforced plastic (CFRP) laminates to enhance the buckling performance of structural steel elements. The research findings were published in *Construction and Building Materials* in early 2020.

**April 9, 2020:** Physicists at ETH Zurich have developed the first high-repetition-rate laser source that produces coherent soft X-rays spanning the entire "water window." That technological breakthrough could enable a broad range of studies in the biological, chemical and material sciences, as well as in physics.

**April 15, 2020:** In Egypt, experts were baffled when they discovered an iron dagger in Tutankhamun's tomb, dating more than 200 years before the Iron Age. The dagger was tested using X-ray fluorescence spectrometry, revealing the blade's composition to be mostly iron.

**April 15, 2020:** Yogesh Vohra, Ph.D., uses microwave-plasma chemical vapor deposition to create thin crystal films of never-before-seen materials. This effort seeks materials that approach a diamond in hardness and are able to survive extreme pressure, temperature and corrosive environments.

**April 16, 2020:** Scientists from Cardiff University have created a new and simple method for creating catalysts: made from precious metals and have shown that gold still remains the most stable and efficient of them all.

**April 16, 2020:** A team of scientists may have developed a way to address a decades-long challenge in the field of quantum materials—the spectral tuning of proposed quantum-light sources.

**April 16, 2020:** One of the major challenges related to space exploration is the development of production technologies capable of exploiting the few resources available in extra-terrestrial environments. Laser 3D printing of lunar dust may be the answer to such queries.

**April 17, 2020:** Several variants of steel exist today; but one type, called martensitic steel, stands out from its steel cousins as stronger and more cost-effective to produce. Hence, martensitic steels naturally lend themselves to applications in the aerospace, automotive and defense industries, among others, where high-strength, lightweight parts need to be manufactured without boosting the cost.

**April 17, 2020:** Researchers have synthesized nanoparticles that can be induced by a change in pH to release a deadly dose of ionized iron within cells. This mechanism could potentially open up new approaches to the targeted elimination of malignant tumors.

**April 17, 2020:** Scientists have theorized that organometallic halide perovskites — a class of light harvesting "wonder" materials for applications in solar cells and quantum electronics — are so promising due to an unseen yet highly controversial mechanism called the Rashba effect. Scientists have now experimentally proven the existence of the effect in bulk perovskites.

**April 17, 2020:** Lithium batteries hold a lot of promise for the future of many applications, including electric vehicles, but tend to be prohibitively expensive. Naoki Yabuuchi, professor at Yokohama National University, and his team have developed a new electrode material to make lithium batteries not only cheaper, but longer lasting with higher energy density.

**April 17, 2020:** Inspired by how human bone and coralline coral reefs adjust mineral deposits in response to their surrounding environments, researchers have created a self-adapting material that can change its stiffness in response to the applied force. This advancement can someday open the doors for materials that can self-reinforce to prepare for increased force or stop further damage.

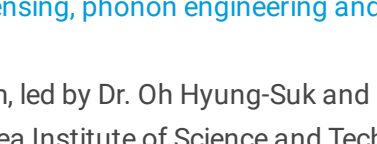
**April 20, 2020:** Researchers at Japan Advanced Institute of Science and Technology (JAIST) have successfully fabricated a suspended graphene nanomesh in the large area by helium ion beam microscopy. This provides a practical way to investigate the intrinsic properties of graphene nanomesh for gas sensing, phonon engineering and quantum technology.

**April 20, 2020:** A research team, led by Dr. Oh Hyung-Suk and Dr. Lee Woong-hee, at the Clean Energy Research Center at Korea Institute of Science and Technology, developed a technology to reduce the use of precious metal catalysts at electrodes where oxygen is produced. The use of precious metal catalysts is one of the problems hindering the practical application of artificial photosynthesis technology.

**April 20, 2020:** A team of researchers affiliated with several institutions in Portugal has identified the molecular structure of follium, a blue watercolor dye used by medieval artists and book publishers. In their paper published in the journal *Science Advances*, the group describes following recipes from ancient manuscripts to produce the dye and then applying modern techniques to identify its molecular structure.

**April 20, 2020:** A new X-ray detector prototype is on the brink of revolutionizing medical imaging, with dramatic reduction in radiation exposure and the associated health risks, while also boosting resolution in security scanners and research applications, thanks to a collaboration between Los Alamos National Laboratory and Argonne National Laboratory researchers.

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