



DECEMBER 2020, ISSUE 90

## WELCOME

With the holiday season underway for many, we would like to convey our warmest holiday wishes to our readers, colleagues, family and friends around the world. We would also like to thank everyone who joined us for our recent "Advanced Topics in Practical Crystallography" lecture series and the latest installment of the "X-ray Computed Tomography for Materials & Life Science" webinar series. You helped make these events a success!

It is gratifying to see that, in so many instances, the scientific community has responded to restrictions imposed by COVID-19 by creating new spaces for learning and innovation, and has realized the value of online tools and platforms to maintain engagement and access to science.

Given the reality of reduced travel and face-to-face gatherings, however, we would like to encourage people to continue to support scientific organizations and associations whose efforts provide education and training, outlets for news, guidance for policymakers, career opportunities, and promotion of sound science. These organizations rely, in part, on revenue from conferences that have cut back over the past year. Here at Rigaku, we continue to present the latest news and applications in X-ray material science.

In closing, we recommend a read for the holiday season: a review article by *Materials Today*. The article, entitled *Materials in 2020*, is edited by Jon Evans and contains features on developments in five important areas of materials research: lithium-ion batteries, energy storage, perovskite solar cells, quantum materials and biomaterials. These are all areas of research where Rigaku's instrumentation continues to provide invaluable insight for pioneers of the materials research world. The 32-page article also provides a glimpse into how, amid the disruption and difficulties of the COVID-19 pandemic, materials science research continued and how engineers and scientists adapted to the new working parameters.

## UPCOMING RIGAKU EVENTS

**X-ray Fluorescence Software and Applications Training (USA)**  
Jan. 26–28, 2021  
Online Class

**ESRF User Meeting 2021**  
Feb. 8–10, 2021  
Virtual Event

**MiniFlex Training (USA)**  
Feb. 9–11, 2021  
Online Class

[VIEW MORE](#)

## FEATURED JOURNALS & REPORTS



### Reports

#### Operator Mode of SmartLab Studio II

By Akito Sasaki, Rigaku Corporation

SmartLab Studio II, an integrated X-ray analysis software program, provides thousands of functions for measurement, analysis, data management, user management, etc. Users familiar with the software and/or who have good skills with X-ray analysis can make full use of all these functions and can make measurements / analyses as they intend. For others, an "operator mode" has been implemented where the operator can easily make routine measurements/analyses without being overwhelmed by unneeded functions.

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## FEATURED PRODUCTS



### SmartLab®

Rigaku SmartLab is the newest and most novel high-resolution X-ray diffractometer (XRD) available today. Perhaps its most novel feature is the new SmartLab Studio II software, which provides the user with an intelligent User Guidance expert system functionality that guides the operator through the intricacies of each experiment. It is like having an expert standing by your side.

[Read More >](#)



### Supermini200

Compared to competing XRF systems, the Rigaku Supermini200 spectrometer offers superior fundamental parameters and empirical software capabilities in a high-resolution instrument with a compact footprint. As a high-power benchtop sequential wavelength dispersive X-ray fluorescence (WDXRF) spectrometer, for elemental analysis of oxygen (O) through uranium (U) in almost any material, the Supermini200 system uniquely delivers low cost-of-ownership (COO) with high resolution and lower limits-of-detection (LLD).

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## FEATURED APPLICATION NOTES



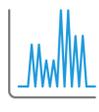
### Raman

#### Analysis of Hand Sanitizer Products Using Handheld 1064 nm Raman

Rigaku Analytical Devices

The use of hand sanitizers is becoming part of the everyday norm, and global demand has grown exponentially over the recent months. Hand sanitizers in liquid and gel formulations are being produced by manufacturing companies around the world. But what if these products consumers think are providing protection actually contain hazardous chemicals or fail to provide the protection they are being relied upon for? The Rigaku Progeny 1064 nm Raman analyzer is the tool of choice among leading regulatory bodies and manufacturers because of its ability to analyze finished products through packaging, as well as identify the chemicals used during manufacturing.

[Read More >](#)



### WDXRF

#### Analysis of Low Concentration Sulfur in Petroleum-based Fuels by WDXRF According to ASTM D2622-16

Rigaku Corporation

Sulfur in petroleum-based fuels contributes to atmospheric pollution. Sulfur content in fuels, especially in automobile fuels, is strictly controlled and regulations of sulfur content in fuel oil such as diesel fuel and gasoline have been tightened. Therefore, control of sulfur content is very important in refinery plants.

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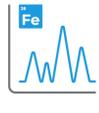
### XRD

#### Crystal Defect Analysis of a Single Crystal Substrate by X-ray Reflection Topography

Rigaku Corporation

Crystal defects in epitaxial thin films may cause problems when producing high-performance semiconductor devices. Epitaxial thin films may inherit crystal defects from the single crystal substrate. It is important to evaluate the grains and crystal defects of the single crystal substrate before film growth on it. X-ray topography is an XRD imaging technique used to observe crystal defect distribution in a single crystal substrate.

[Read More >](#)



### EDXRF

#### Academia & Teaching

Applied Rigaku Technologies

The NEX QC\* QuantEZ spectrometer is highlighted as a compact, powerful, affordable EDXRF system for use in academia for teaching and basic research. 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.

[Read More >](#)

## FEATURED VIDEO & USEFUL LINK OF THE MONTH



### Rigaku TOPIQ | Use of handheld LIBS for QA/QC of metal alloys for critical applications

Learn how the Rigaku KT-100S Handheld LIBS Analyzer offers the proven robustness, accuracy and reporting needed for metal alloy verification applications.



### PlasticPortal.eu

Daily updated portal associating companies operating in the plastics industry. Classifieds - Sales, Purchase, Labor Market, News, Articles, Calendar of Seminars and Exhibitions.

## MATERIALS ANALYSIS IN THE NEWS

**November 24, 2020:** Blending is a powerful strategy for improving the performance of rapidly, coatings, separation membranes and other functional materials. [A new method for quickly, coatings, separation membranes and other functional materials](#) could significantly accelerate material development.

**November 30, 2020:** A recent two-part study at the University of Illinois Urbana-Champaign developed [a method to create 3D models of the fibers within composite materials](#) then used that information to predict the thermal conductivity of the material.

**December 2, 2020:** An international team of scientists used high-energy X-rays to analyze 12 fragments from ancient Egyptian papyrus and found lead compounds in both red and black inks used. Painters in 15th-century Europe used a similar technique when developing oil paints, but [the study suggests ancient Egyptians discovered it 1,400 years earlier](#).

**December 3, 2020:** The future of mobility is electric cars, trucks and airplanes, but there is no way a single battery design can power that future. [A new method could be the key to designing more efficient batteries for specific uses](#), like electric cars and airplanes.

**December 7, 2020:** Researchers have made two discoveries that can expand additive manufacturing in aerospace and other industries that rely on strong metal parts. They discovered [why structural defects occur during the additive manufacture of parts made from a high-strength, light-weight titanium alloy widely used in aerospace applications](#) and present a process map to help manufacturers avoid generating defects during a common additive manufacturing technique called laser powder bed fusion.

**December 7, 2020:** Security officials are tasked with preventing criminals from smuggling dangerous materials into a country, and detecting nuclear substances has been difficult and costly. Now Northwestern University researchers have [developed new devices based on a low-cost material to aid in the detection and identification of radioactive isotopes](#).

**December 9, 2020:** The amount of concrete, asphalt, metal and plastic on Earth is growing fast. This year may mark the point when artificial stuff outweighs living things. A study by a team of scientists from the Weizman Institute in Israel has found that [all things human-made, known as anthropogenic mass, now weigh the same as all of Earth's living biomass](#).

**December 9, 2020:** Particulate emissions from cooking stay in the atmosphere for longer than [previously thought](#), according to a new study employing simultaneous small and wide-angle X-ray scattering (SAXS/WAXS) and Raman microscopy. Researchers at the University of Birmingham succeeded in demonstrating how cooking emissions are able to survive in the atmosphere over several days, rather than being broken up and dispersed.

**December 9, 2020:** In a recent study, scientists from Japan demonstrate how the Yb to Si ratio in the ytterbium silicide (Yb-Si)—a promising coating material for the high-temperature sections of aircraft gas turbine engines—and the surrounding atmosphere, affect the oxidation processes, [opening doors to more energy efficient gas turbines](#).

**December 10, 2020:** Researchers used powerful X-rays to see the preserved remains of an ancient Egyptian girl without disturbing the linen wrappings. The results of those tests point to [a new way to study mummified specimens](#).

**December 12, 2020:** If we're going to get better at finding ways of efficiently storing that energy until it's needed—and scientists have identified a particular material that could give us exactly that.

**December 14, 2020:** A multi-institutional research team led by materials scientists from Pacific Northwest National Laboratory (PNNL) has designed [a highly active and durable catalyst that doesn't rely on costly platinum to spur the necessary chemical reaction](#).

**December 15, 2020:** A team of researchers from Russia, the United States and China led by Skoltech Professor Artem R. Oganov have [discovered an unexpected very complex europium hydride, Eu<sub>8</sub>H<sub>16</sub>](#). The paper detailing the discovery has been published in *The Journal of Physical Chemistry Letters*.

**December 15, 2020:** Japanese scientists find crumbly samples of the asteroid Ryugu in capsule, [secure first sample of extraterrestrial gases](#).

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