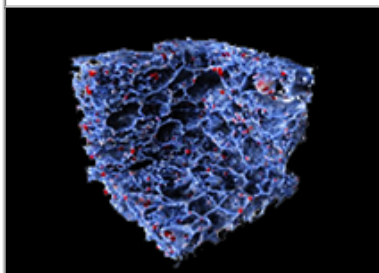




### Upcoming Webinar



### X-ray Computed Tomography for Materials Science

Join us on December 11th for the fourth webinar on X-ray Computed Tomography for Materials Science. Learn about X-ray CT applications in the foam and composite industries such as analysis of foam pore size, cell wall thickness, fiber orientation, filler density, and crack propagation in composites. Find out how to achieve high-resolution imaging to study those materials in detail. **More info >**

### Versatile dual wavelength X-ray diffractometer with HPC X-ray detector



### XtaLAB Synergy-DW

One source with two high-flux

## Welcome

December will be another busy month for Rigaku with various events planned. To highlight a few, Rigaku will be at [MRS Fall Meeting & Exhibit](#) (Booth #1017) and also hosting a workshop at [AsCA 2019](#). See a complete [listing of conferences and tradeshow](#)s that Rigaku will be attending or exhibiting.

On December 11, Rigaku invites you to join a webinar on X-ray CT for Materials Science. Discussions will include several application examples related to foams and composite materials. [Register](#) today to learn more about these techniques.



*Scenic images near Rigaku Yamanashi Factory. Pictures by Masayuki Watanabe.*

This month's issue highlights a few Rigaku events from October. One report covers EXPO&more International Workshop. EXPO is crystallographic software for powder diffraction data. Many people traveled from all over the world to learn about EXPO. The other featured report chronicles the third X-ray Microscopy Seminar and Workshop at Rigaku's facility in The Woodlands, Texas.

This month's issue also contains application notes for XRD, WDXRF, EDXRF, and a featured Rigaku Journal article that examines electronic components using the nano3DX CT microscope.

Enjoy!

### aku Joui

### Featured Rigaku Journal Article

*Examination of electronic components with the nano3DX X-ray CT microscope*

Rigaku Corporation



X-ray computed tomography (CT) is a nondestructive imaging technique that can be used to examine the internal features of an object in three dimensions (3D). The

wavelengths is the foundation of the revolutionary XtaLAB Synergy-DW single crystal X-ray diffractometer. It combines the increased flux of a rotating anode X-ray source with the flexibility of two different wavelengths, making it ideal for laboratories exploring a wide range of research interests.

**For more >**

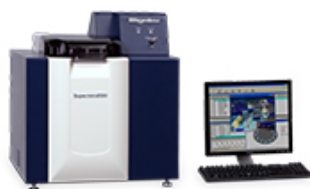
### Interested in publishing your work in The Bridge?



### Publish Your Work Here

The Bridge now welcomes manuscripts, communications, and papers that describe techniques and applications of all forms of X-ray fluorescence (XRF) and X-ray diffraction (XRD, including SAXS) that are of interest to fellow scientists in industry, academia, and government. Manuscripts, in PDF format, are only accepted with the understanding that they are not commercial in nature. Authors are responsible for all statements made in their work. If illustrations or other material in a manuscript have been published previously, the author is responsible for obtaining permission to republish. Please [email copy](#) to the editor.

### Elemental analysis of solids, liquids, powders, alloys and thin films



Supermini200

first commercial X-ray CT scanner was introduced 45 years ago and the technique has been widely used in the medical and industrial fields since. **Full article >**



### Featured Rigaku Event

#### EXPO&more International Workshop

Reported by Akito Sasaki & Akihiro Himeda, XRD Application & Software Development Dept., Rigaku Corporation

The EXPO&more International Workshop was held at Polytechnic of Bari, Italy, from September 30th through October 3rd, 2019. Angela Altomare *et al.* at IC/CNR (Istituto di Cristallografia/Consiglio Nazionale delle Ricerche) have been developing EXPO crystal structure analysis software for over 20 years, applying direct methods and direct space methods to powder X-ray diffraction (PXRD) data. Typically, single crystal diffraction data is used for structure analysis. However, when high-quality single crystals cannot be obtained for some reason, scientists would like to perform crystal structure analysis using PXRD data. **For more >**



### Featured Rigaku Event

#### Rigaku X-ray Microscopy Seminar and Workshop

Reported by Tom McNulty, Sr VP GM Materials Analysis, Rigaku Americas Corporation

X-ray computed tomography (CT) is well known as a diagnostic technique in the medical arena or as a non-destructive inspection technique for luggage and various mechanical parts. X-ray source and detector technologies, along with data processing techniques, have advanced rapidly in recent years, making X-ray CT a great imaging technique for Materials and Life Science. Since the technique is relatively new to those fields, it is still very much under-recognized. As a leading X-ray company, we hosted our third X-ray Microscopy Seminar and Workshop at our Rigaku facility in The Woodlands, Texas on October 30, 2019. **Full details >**



### XRD Application Note

#### High Speed RSM of a III-nitride Epitaxial Film by 1D Detection Mode

Rigaku Corporation

Reciprocal space mapping (RSM) is an XRD technique used to evaluate lattice spacing and crystal orientation distribution independently from each other, applied to the analysis of thin film samples such as epitaxial films. Since a reciprocal space map requires multiple scans with various combinations of the scattering angle ( $2\theta$ ) and the incident angle with respect to the sample ( $\omega$ ), it can take a relatively long time to collect the necessary data in general. **For more >**



### WDXRF Application Note

#### Fe, Ni and Co Alloy Analysis by the Fundamental Parameter Method Using the Simultix 15

Rigaku Corporation

The multi-channel X-ray fluorescence spectrometer "Simultix15" enables simultaneous measurement of all elements in samples, which makes it ideal for process control in production lines where extremely rapid analysis is required. Fe, Ni and Co based alloys, including high-temperature alloys, tool steel, and stainless steel, have broad ranges of concentrations for many elements. These alloys are analyzed for production control by X-ray fluorescence (XRF) spectrometry.

**For more >**

### EDXRF Application Note

As the world's only high-power benchtop sequential wavelength dispersive X-ray fluorescence (WDXRF) spectrometer for elemental analysis of oxygen (O) through uranium (U) of almost any material, the Rigaku Supermini200 uniquely delivers low cost-of-ownership (COO) with high resolution and lower limits-of-detection (LLD). **For more >**

#### Video of the Month



#### ESSDERC and ESSCIRC Conference Video

This short film highlights the 49th European Solid-State Device Research Conference (ESSDERC) and the 45th European Solid-State Circuits Conference (ESSCIRC) held in Kraków, Poland. This conference took place September 23 – 26, 2019. Rigaku was the Diamond Sponsor for this event.

**See video >**

#### Conferences and Workshops



#### Join Rigaku at future meetings

Rigaku will be sponsoring, attending or exhibiting at the following conferences and trade shows:

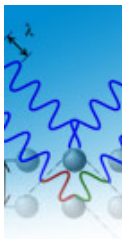
**MRS Fall**



#### Metals in Crude & Resid as per ASTM D8252

*Applied Rigaku Technologies*

The analysis of nickel, vanadium and iron in crude and residual oil as per ASTM D8252 is demonstrated in this application note. The measurement also includes the analysis of sulfur complying with ASTM D4294. **For more >**



#### Material Analysis in the News

##### News for November 2019

**November 15, 2019.** Researchers at Brown University believe they [may have identified a new state of matter](#) in the behaviors of Cooper pairs of electrons. The scientists from Brown, along with several universities and consortia in China, combined their efforts to study this “third state” phenomenon.

**November 18, 2019.** [A Japanese space probe is heading home from](#) an asteroid 250 million km (155 million miles) from Earth after collecting sub-surface samples that could help scientists seeking the origins of life. If the return trip is completed successfully, that will be the first time samples from beneath an asteroid's surface have been brought back to Earth.

**November 20, 2019.** Researchers from University of Toronto Engineering and Caltech have designed a new and [improved pathway to carbon-neutral plastics](#). The system efficiently converts CO<sub>2</sub>, water, and renewable energy into ethylene—the precursor to a wide range of plastic products, from medical devices to synthetic fabrics—under neutral conditions.

**November 20, 2019.** Popularly used as a chemical agent in fertilizers, phosphate is a high-demand mineral. Before the [mining process](#) can begin, owners must conduct wildlife surveys, relocate threatened and endangered species and clear the property.

**November 20, 2019.** Scientists have developed [a new approach for making metal-metal composites and porous metals](#) with a 3-D interconnected “bicontinuous” structure in thin films at size scales ranging from tens of nanometers to microns.

**November 20, 2019.** Just four years after introducing a partnership with Parley for the Oceans, with the goal to [highlight environmental impact of plastic](#) and replace the use of all virgin polyester with recycled marine waste by 2024, Adidas has manufactured more than six million pairs of shoes with the new material.

**November 20, 2019.** Building materials that clean themselves could save immense time and labor in homes and businesses, as well as reduce disease risk in settings such as hospitals. [Researchers have made a new type of self-cleaning concrete](#) that is strong, heat-insulating and soundproof.

**November 20, 2019.** Everything in our Universe is held together or pushed apart by four fundamental forces: gravity, electromagnetism, and two nuclear interactions. Physicists now think they've found even more [evidence of a new force of nature](#), spotting the actions of a fifth physical force emerging from a helium atom.

**November 20, 2019.** Chemists have created new route to PHAs: [naturally degradable bioplastics](#). At a Colorado State University chemistry laboratory, some of the best minds in polymer science are working toward what they think is a viable solution to the crisis of petroleum-based plastics, which are sitting in our landfills, floating in our oceans, and showing up in our air and food.

Boston, MA, USA  
December 1 – 6, 2019

#### **USBTA Technology Training**

Orlando, Florida, USA  
December 3 – 6, 2019

#### **Science Expo**

Osaka, Japan  
December 4 – 6, 2019

**See the complete list >**

#### **Useful Link of the Month**



#### **How-To: Take a Screenshot on Any Device**

This helpful article from PCMag provides steps for taking a screenshot on any device. Tutorials cover various platforms: Windows, macOS, ChromeOS, iOS, Android, and Linux. **For more >**

#### **Planning to submit a grant?**



#### **Rigaku is happy to assist**

If you are planning on submitting an instrument grant proposal, Rigaku will be happy to assist you. We can help you determine the correct instrument and configuration best suited for your analytical needs. **Start the process >**

#### **Rigaku's Materials Analysis**

**November 20, 2019.** [A new glass material](#), developed by Tampere University researcher Erkka Frankberg and colleagues, appears to possess metal-like ductility at room temperature. It bends without breaking.

**November 20, 2019.** For three Martian years, NASA's Curiosity rover [has found unexplained oxygen on Mars](#). It has been sniffing the air above Mars' Gale Crater, its near-equatorial exploration site, and using its Sample Analysis at Mars (SAM) portable chemistry lab, the rover has ascertained not only what the surface atmosphere is made of, but also how its gases change with the seasons.



#### **Recent Scientific Papers of Interest**

*Papers for November 2019*

*Recent Scientific Papers of Interest* is a monthly compilation of material analysis papers appearing in recently released journals and publications. **See below**

**Calibrating high resolution XRF core scanner data to obtain absolute metal concentrations in highly polluted marine deposits after two case studies off Portmán Bay and Barcelona, Spain** Cerdà-Domènech, M.; Frigola, J.; Sanchez-Vidal, A.; Canals, M. *Science of The Total Environment*. Nov2019, 134778. DOI: [10.1016/j.scitotenv.2019.134778](https://doi.org/10.1016/j.scitotenv.2019.134778).

**High resolution multielement XRF spectroscopy of extended and diffused sources with a graphite mosaic crystal based Von Hamos spectrometer.** Scordo, A.; Breschi, L.; Curceanu, C.; Miliucci, M.; Sirghi, F.; Zmeskal, J.J. *Anal. At. Spectrom.* 2019, Advance Article DOI: [10.1039/C9JA00269C](https://doi.org/10.1039/C9JA00269C).

**Understanding the laser-induced aerosol ablation of sub-micron liquid particles via size-resolved spectral and image analyses.** Sher Afgan, Muhammad; Sheta, Sahar; Hou, Zongyu; Li, Zheng; Wang, Zhe. *J. Anal. At. Spectrom.* 2019, Advance Article DOI: [10.1039/C9JA00278B](https://doi.org/10.1039/C9JA00278B).

**Determination of copper-based mineral species by laser induced breakdown spectroscopy and chemometric methods.** Álvarez, Jonnathan; Velásquez, Marizú; Kumar Myakalwar, Ashwin; Sandoval, Claudio; Fuentes, Rodrigo; Castillo, Rosario; Sbarbaro, Daniel; Yáñez, Jorge. *J. Anal. At. Spectrom.* 2019, Advance Article. DOI: [10.1039/C9JA00271E](https://doi.org/10.1039/C9JA00271E).

**Influence of sample temperature on the laser-induced breakdown spectroscopy of a molybdenum–tungsten alloy.** Hai, Ran; He, Zhonglin; Wu, Ding; Tong, Weina; Sattar, Harse; Imran, Muhammad; Ding, Hongbin. *J. Anal. At. Spectrom.* 2019, Advance Article. DOI: [10.1039/C9JA00261H](https://doi.org/10.1039/C9JA00261H).

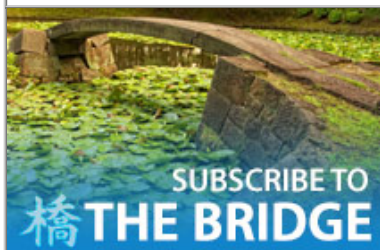
**Micro-invasive depth profile analysis by laser-induced breakdown spectroscopy (LIBS): the case of mercury layers on Sasanian coins.** Gaudiuso, Rosalba; Uhlir, Katharina; Griesser, Martina. *J. Anal. At. Spectrom.* 2019, 34, 2261-2272. DOI: [10.1039/C9JA00165D](https://doi.org/10.1039/C9JA00165D).

**An integrated approach between neutron diffraction and elemental imaging through neutron resonance transmission imaging: preliminary results on Chinese bimetallic sword fragments.** Fedrigo, Anna; Raspino, Davide; Grazi, Francesco; Scherillo, Antonella. *J. Anal. At. Spectrom.* 2019, Advance Article. DOI: [10.1039/C9JA00300B](https://doi.org/10.1039/C9JA00300B).

**Aerosol synthesis of thermally stable porous noble metals and alloys by using bi-functional templates.** Odziomek, Mateusz; Bahri, Mounib; Boissiere, Cedric; Sanchez, Clement; Lassalle-Kaiser, Benedikt; Zitolo, Andrea; Ersen, Ovidiu; Nowak, Sophie; Tard, Cedric; Giraud, Marion; Faustini, Marco; Peron, Jennifer. *Mater. Horiz.* 2019, Advance Article. DOI: [10.1039/C9MH01408J](https://doi.org/10.1039/C9MH01408J).

**High rate performance of aqueous magnesium-ion batteries based on the  $\delta$ -MnO<sub>2</sub>@carbon molecular sieves composite as the cathode and nanowire VO<sub>2</sub> as the anode.** Zhang, Hongyu; Cao, Dianxue; Bai, Xue. *Journal of Power Sources*. Dec2019, Vol. 444, 227299. DOI: [10.1016/j.jpowsour.2019.227299](https://doi.org/10.1016/j.jpowsour.2019.227299).

## eNewsletter, The Bridge



Join us

Each month, Rigaku distributes two eNewsletters: *The Bridge*, which focuses on Materials Analysis, and *Crystallography Times*, which concentrates on X-ray crystallography. **Join us >**

**Controllable microstructure of polymer-small molecule blend thin films for high-performance organic field-effect transistors.** Shen, Tao; Zhou, Hui; Xin, Juan; Fan, Qin; Yang, Zilu; Wang, Jianying; Mei, Tao; Wang, Xianbao; Wang, Ning; Li, Jinhua. *Applied Surface Science*. Dec2019, Vol. 498, 143822. DOI: [10.1016/j.apsusc.2019.143822](https://doi.org/10.1016/j.apsusc.2019.143822).

**Extraterrestrial ribose and other sugars in primitive meteorites.** Furukawa, Yoshihiro; Chikaraishi, Yoshito; Ohkouchi, Naohiko; Ogawa, Nanako O.; Glavin, Daniel P.; Dworkin, Jason P.; Abe, Chiaki; Nakamura, Tomoki. *Proceedings of the National Academy of Sciences*. Nov2019, 201907169. DOI: [10.1073/pnas.1907169116](https://doi.org/10.1073/pnas.1907169116).

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