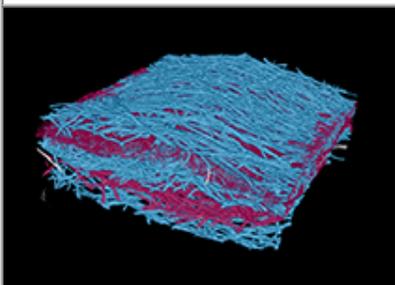




### Upcoming Webinar Series



#### X-ray Computed Tomography for Materials Science

Join us on April 3rd for the first in a series of webinars on X-ray Computed Tomography for Materials Science. Learn about the principles of the X-ray CT technique and how it can be applied to a wide range of materials. Find out how to create high-resolution images of your material and visualize your samples in three-dimensions.

**For more information >**

#### MiniFlex – qualitative and quantitative analysis of polycrystalline materials



#### Benchtop X-ray diffraction (XRD) instrument

## Welcome

In March we have two big events: ARABLAB and Pittcon. As usual, ARABLAB will be held in Dubai and runs from March 12th to the 14th. The Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy will be in Philadelphia this year (March 17–21, Booth #3151). Please come by to see what's new and visit. A complete list of all upcoming events can be found [here](#).

In early April we welcome you to join us for the first in a series of Webinars on X-ray CT for Materials Science. Well known in the medical arena, X-ray Computed Tomography and the technology behind it has advanced rapidly, putting the analysis of all types of materials within easy reach. Register today to learn more about this technique and its potential applications.



The featured *Rigaku Journal* article this month covers the development of innovative organic semiconductors driven by state-of-art analytical instruments. We also included a human interest article about a business trip to India by Dr. Akito Sasaki.

This month's featured XRD technical note discusses high-throughput processing of 2D XRD images. The WDXRF application note explores Fixed Angle Measurement using the Semi-Quantitative Analysis Function "SQX" of ZSX Guidance Software.

The book review covers *Broken Ballots: Will Your Vote Count?* by Douglas W. Jones and Barbara Simons. Check out the interesting video of the Hayabusa2 spacecraft interacting with an asteroid. And, as always, the news and papers sections are at the bottom of the page for a taste of the latest developments in materials science.

R.C. Tisdale, Ph.D. – Editor

**Featured Rigaku Journal Article**

New sixth generation MiniFlex X-ray diffractometer (XRD) is a multipurpose analytical instrument that can determine: phase identification and quantification, percent (%) crystallinity, crystallite size and strain, lattice parameter refinement, Rietveld refinement, and molecular structure. It is widely used in research, especially in material science and chemistry, as well as in industry for research and quality control. It is the newest addition to MiniFlex series of benchtop X-ray diffraction analyzers from Rigaku, which began with the introduction of the original MiniFlex system decades ago. **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,



### Development of innovative organic semiconductors driven by state-of-art analytical instruments

Rigaku Corporation

Organic electronics based on organic semiconductors as an active layer have been extensively researched as next-generation electronic devices. To develop the market for organic electronic devices such as integration circuits and sensors, the carrier mobility is an important parameter for device performance and needs to be improved significantly. **Full article >**

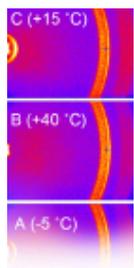


### Featured Rigaku Report

#### A Business Trip to India

Reported by Akito Sasaki, Rigaku Corporation

I went to Trivandrum, Kerala, India, in the middle of January. I had several business meetings there with an IT company that has provided us with software development services for the past decade. I visit Trivandrum in this “Kerala’s winter” every year, reviewing our development activities from the previous year and discussing development plans for the forthcoming year. **Full article >**



### XRD Application Note

#### High-throughput processing of 2D XRD images – Direct observation of melting and crystallization of fresh cream

Rigaku Corporation

To investigate the crystal structure of a material sensitive to changes in environment, it is necessary to obtain diffraction data rapidly and accurately under a precisely controlled measurement environment. By combining a two-dimensional (2D) detector with attachments that precisely control ambient conditions such as temperature, humidity, and inert gas, even fast structural changes are revealed in the 2D diffraction patterns. **For more >**



### WDXRF Application Note

#### Fixed Angle Measurement using the Semi-Quantitative Analysis Function “SQX” of ZSX Guidance Software

Rigaku Corporation

X-ray fluorescence (XRF) analysis has been widely used for quality control or production control in a variety of industries because it has many positive features, such as simple sample preparation, short analysis time, and high repeatability with low human error, compared to other elemental analysis methods, such as ICP-OES or AA. **For more >**



### EDXRF Application Note

#### Manganese in Gasoline

Applied Rigaku Technologies

Methylcyclopentadienyl manganese tricarbonyl (called MMT or MCMT) is an anti-knock agent added to motor gasoline and Avgas to boost octane rating, replacing tetraethyl lead (TEL) in many regions of the world. In motor gasoline the Mn content is typically between 50–500 mg/kg, and can be as high as 3000 mg/kg (approximately 3 g/L) in Avgas. Reliably characterizing the Mn content of gasoline ensures optimum engine performance based on the engine's compression ratio

## liquids, powders, alloys and thin films



### Supermini200

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



### Watch Japanese Probe Approach Asteroid to Snag Samples

The Hayabusa2 spacecraft successfully nabbed bits of the 3,000-foot-wide (900 meters) asteroid Ryugu (Feb. 21; Feb. 22 Japan time), Japan Aerospace Exploration Agency (JAXA) officials announced. Hayabusa2 spiraled down to Ryugu's surface, fired a 0.2-ounce (5 grams) tantalum "bullet" into the boulder-strewn rock at close range, and collected pieces of the ejected material using its specialized "sampling horn," JAXA officials said during a press conference. **For more >**

and other geometrical and mechanical operating conditions. To meet the needs of the industry, Rigaku offers NEX QC, a simple and versatile benchtop EDXRF analyzer for the analysis of manganese in gasoline. **For more >**

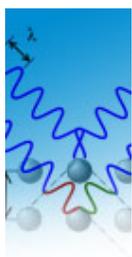


### Book Review

#### [Broken Ballots: Will Your Vote Count?](#)

By Douglas W. Jones and Barbara Simons

*Broken Ballots: Will Your Vote Count?* is the product of a collaboration between Douglas W. Jones, a computer science professor at the University of Iowa, and Barbara Simons, a former IBM Research employee. *Broken Ballots* takes a deep, methodical dive into the popular vote tradition in American electoral history and the automation of the voting process, making certain repeating patterns of election controversy quite clear. **Read review >**



### Material Analysis in the News

#### [News for February 2019](#)

**February 1, 2019.** Researchers at the Nagoya Institute of Technology (NITech) in Japan have demonstrated that a specific material can act as an efficient battery component for [sodium-ion batteries that will compete with lithium-ion batteries](#) for several battery characteristics, especially speed of charge. The research was spearheaded by Naoto Tanibata, Ph.D., an Assistant Professor at the Department of Advanced Ceramics at NITech.

**February 3, 2019** Scientists have [charted the environment surrounding a stellar-mass black hole](#) that is 10 times the mass of the Sun using NASA's Neutron star Interior Composition Explorer (NICER) payload aboard the International Space Station. NICER detected X-ray light from the recently discovered black hole, called MAXI J1820+070 (J1820 for short), as it consumed material from a companion star.

**February 5, 2019.** Japanese physicists have adapted sensitive muon detectors designed for particle physics experiments to monitor the innards of active volcanoes in a technique known as [muon transmission imaging or muography](#). Detectors are positioned around the volcano and the flux of muons from different directions is measured.

**February 7, 2019.** A research group in Japan has found a method to develop stronger, longer-lasting materials using a strategy inspired by the process responsible for muscle growth. Mimicking this process in natural muscle, researchers led by Professor Gong Jian Ping of Hokkaido University, Japan, developed what they call [double-network hydrogels made from 85 percent water](#) and two types of polymer networks—one rigid and brittle, the other soft and stretchable.

**February 7, 2019.** Katsuhiko Ariga and colleagues in Japan's National Institute for Materials Science examined [recent progress in materials nanoarchitectonics](#). They believe that predicting the future of these materials requires an examination of biological systems, such as cell and protein surfaces, and macromolecular interfaces.

**February 7, 2019.** A research team led by Tohoku University in Japan has developed new [materials for supercapacitors with higher voltage and better stability](#) than other materials. The new material is a sheet made from a continuous three-dimensional framework of graphene mesosponge, a carbon-based material

## Conferences and Workshops



### Join Rigaku at future meetings

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

#### **APS 2019**

Boston, MA, US  
Mar 4 – 8, 2019

#### **Security Show**

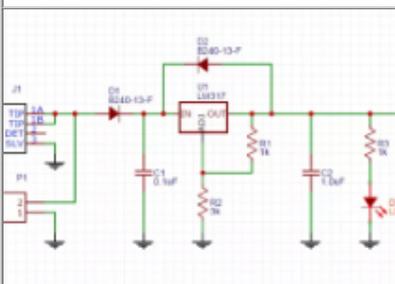
Tokyo, Japan  
March 5 – 8, 2019

#### **ARABLAB**

Dubai, UAE  
March 12 – 14, 2019

**See the complete list >**

## Useful Link of the Month



### An Easier Electronic Circuit Design Experience

One of the best circuit design tools: free, zero-install, easy to use and brings you a superior electronic design automation (EDA) experience. It integrates powerful schematic capture, mixed-mode circuit simulation and PCB layout. One of the advantages is that you

containing nanoscale pores.

**February 8, 2019.** A research team led by Hokkaido University in Japan has constructed a [porous material that is very stable and changes color when exposed to acid vapor](#). This is believed to be the first reported instance of a hydrogen-bonded organic framework changing color in response to acid. Chemists are working to develop porous materials made from organic molecules that have structures with well-defined openings that can separate and store gasses.

**February 12, 2019.** Researchers at Kanazawa University report that a [crystal of molecules known as pillar\[5\]arenes](#) (abbreviated 'P5') can form a host-guest compound with poly(ethylene oxides) polymers. The effect can be used to select polymers with different molecular weights and end groups. X-ray diffraction experiments showed that the crystal structure of the P5 molecules had changed into a network featuring channels.

**February 22, 2019.** A [Japanese spacecraft has touched down on an asteroid](#) in an attempt to collect a sample of rock from the surface. The spacecraft reached asteroid Ryugu in June 2018 after a three-and-a-half-year journey from Earth. Hayabusa-2 is expected to return to Earth in 2020 along with its rocky hoard.



## Recent Scientific Papers of Interest

### Papers for February 2019

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

**D+:** software for high-resolution hierarchical modeling of solution X-ray scattering from complex structures. Ginsburg, Avi; Ben-Nun, Tal; Asor, Roi; Shemesh, Asaf; Fink, Lea; Tekoah, Roei; Levartovsky, Yehonatan; Khaykelson, Daniel; Dharan, Raviv; Fellig, Amos; Raviv, Uri. Journal of Applied Crystallography. Feb2019, Vol. 52 Issue 1, p219-242. 24p. DOI: [10.1107/S1600576718018046](https://doi.org/10.1107/S1600576718018046).

**Influence of experimental procedure on d-spacing measurement by XRD of montmorillonite clay pastes containing PCE-based superplasticizer.** Borralleras, Pere; Segura, Ignacio; Aranda, Miguel A.G.; Aguado, Antonio. Cement & Concrete Research. Feb2019, Vol. 116, p266-272. 7p. DOI: [10.1016/j.cemconres.2018.11.015](https://doi.org/10.1016/j.cemconres.2018.11.015).

**Colloidal Crystals of NaYF<sub>4</sub> Upconversion Nanocrystals Studied by Small-Angle X-Ray Scattering.** (SAXS) Homann, Christian; Bolze, Joerg; Haase, Markus. Particle & Particle Systems Characterization. Feb2019, Vol. 36 Issue 2, pN.PAG-N.PAG. 1p. DOI: [10.1002/ppsc.201800391](https://doi.org/10.1002/ppsc.201800391).

**Analysis of styrene maleic acid alternating copolymer supramolecular assemblies in solution by small angle X-ray scattering.** Brady, Nathan G.; Qian, Shuo; Bruce, Barry D. European Polymer Journal. Feb2019, Vol. 111, p178-184. 7p. DOI: [10.1016/j.eurpolymj.2018.11.034](https://doi.org/10.1016/j.eurpolymj.2018.11.034).

**Investigation of complex residual stress states in the near-surface region: Evaluation of the complete stress tensor by X-ray diffraction pattern decomposition.** Schoderböck, Peter. Applied Surface Science. Feb2019, Vol. 466, p151-164. 14p. DOI: [10.1016/j.apsusc.2018.10.010](https://doi.org/10.1016/j.apsusc.2018.10.010).

**Ultrasound-based formation of nano-Pickering emulsions investigated via in-situ SAXS.** Lee, Yi-Ting; Li, David S.; Ilavsky, Jan; Kuzmenko, Ivan; Jeng, Geng-Shi; O'Donnell, Matthew; Pozzo, Lilo D. Journal of Colloid & Interface Science. Feb2019, Vol. 536, p281-290. 10p. DOI:

can edit the schematics wherever you have an Internet connection. EasyEDA desktop client is also available; it based on the open source project Electron.

**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 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 >**

[10.1016/j.jcis.2018.10.047](https://doi.org/10.1016/j.jcis.2018.10.047).

**Pore formation mechanism of oriented  $\beta$  polypropylene cast films during stretching and optimization of stretching methods: *In-situ* SAXS and WAXD studies.** Wu, Gao-Gao; Chen, Wen-Bo; Ding, Chao; Xu, Li-Yang; Liu, Zheng-Ying; Yang, Wei; Yang, Ming-Bo. *Polymer*. Feb2019, Vol. 163, p86-95. 10p. DOI: [10.1016/j.polymer.2018.12.051](https://doi.org/10.1016/j.polymer.2018.12.051).

**A new XRF spectrometer using a crystal monochromator and parallel plates beam guides.** Perez, R.D.; Falchini, G.E.; Vincente, F. Cometto; Soares, L.; Poletti, M.E.; Sánchez, H.J. *Nuclear Instruments & Methods in Physics Research Section B*. Feb2019, Vol. 440, p48-53. 6p. DOI: [10.1016/j.nimb.2018.11.030](https://doi.org/10.1016/j.nimb.2018.11.030).

**Effect of Ni substitute in off-stoichiometric Bi(Pb)-Sr-Ca-Cu(Ni)-O superconductor. Excess conductivity, XRD analysis and thermal behaviour.** Harabor, Ana; Rotaru, Petre; Harabor, Novac Adrian. *Ceramics International*. Feb2019:Part B, Vol. 45 Issue 2, p2742-2750. 9p. DOI: [10.1016/j.ceramint.2018.09.060](https://doi.org/10.1016/j.ceramint.2018.09.060).

**Insight into the BiFeO<sub>3</sub> flash sintering process by *in-situ* energy dispersive X-ray diffraction (ED-XRD).** Perez-Maqueda, Luis A.; Gil-Gonzalez, Eva; Wassel, Mary Anne; Jha, Shikhar K.; Perejon, Antonio; Charalambous, Harry; Okasinski, John; Sanchez-Jimenez, Pedro E.; Tsakalakos, Thomas. *Ceramics International*. Feb2019:Part B, Vol. 45 Issue 2, p2828-2834. 7p. DOI: [10.1016/j.ceramint.2018.07.293](https://doi.org/10.1016/j.ceramint.2018.07.293).

**The effect of a binder on porosity of the nanoporous RP-20 carbon. A combined study by small angle X-ray and neutron scattering.** Härk, Eneli; Petzold, Albrecht; Goerigk, Günter; Ballauff, Matthias; Kent, Ben; Keiderling, Uwe; Palm, Rasmus; Vaas, Ingrid; Lust, Enn. *Microporous & Mesoporous Materials*. Feb2019, Vol. 275, p139-146. 8p. DOI: [10.1016/j.micromeso.2018.08.022](https://doi.org/10.1016/j.micromeso.2018.08.022).

**Depth of layers in historical materials measurable by X-ray fluorescence analysis.** Trojek, Tomáš; Musílek, Ladislav; Prokeš, Radek. *Radiation Physics & Chemistry*. Feb2019, Vol. 155, p239-243. 5p. DOI: [10.1016/j.radphyschem.2018.06.047](https://doi.org/10.1016/j.radphyschem.2018.06.047).

**A direct and safe method for plutonium determination using total reflection X-ray fluorescence spectrometry.** Dhara, Sangita; Sanyal, Kaushik; Paul, Sumana; Misra, N. L. *JAAS (Journal of Analytical Atomic Spectrometry)*. Feb2019, Vol. 34 Issue 2, p366-374. 9p. DOI: [10.1039/c8ja00351c](https://doi.org/10.1039/c8ja00351c).

**Direct determination of Ca, K, Mg, Na, P, S, Fe and Zn in bivalve mollusks by wavelength dispersive X-ray fluorescence (WDXRF) and laser-induced breakdown spectroscopy (LIBS).** Costa, Vinicius Câmara; Amorim, Fábio Alan Carqueija; de Babos, Diego Victor; Pereira-Filho, Edenir Rodrigues. *Food Chemistry*. Feb2019, Vol. 273, p91-98. 8p. DOI: [10.1016/j.foodchem.2018.02.016](https://doi.org/10.1016/j.foodchem.2018.02.016).

**Wavelength dispersive X-ray fluorescence determination of major oxides in bottom and peat sediments for paleoclimatic studies.** Amosova, Alena A.; Chubarov, Victor M.; Pashkova, Galina V.; Finkelshtein, Alexander L.; Bezrukova, Elena V. *Applied Radiation & Isotopes*. Feb2019, Vol. 144, p118-123. 6p. DOI: [10.1016/j.apradiso.2018.11.004](https://doi.org/10.1016/j.apradiso.2018.11.004).

**In vitro study of the demineralization induced in human enamel by an acidic beverage using X-ray fluorescence spectroscopy and Raman microscopy.** Cândido, M.; Silveira, J.M.; Mata, A.; Carvalho, M.L.; Pessanha, S. *XRS: X-ray Spectrometry*. Feb/Mar2019, Vol. 48 Issue 1, p61-69. 9p. DOI: [10.1002/xrs.2987](https://doi.org/10.1002/xrs.2987).

**Lead speciation of PM<sub>2.5</sub> collected from Greater Cairo, Egypt and Zarqa, Jordan: An energy dispersive X-ray fluorescence and X-ray absorption near edge structure study.** Shaltout, Abdallah A.; Ahmed, Sameh I.; Harfouche, Messaoud; Hassan, Salwa K.; Eid, Kamal A. *XRS: X-*

*ray Spectrometry*. Feb/Mar2019, Vol. 48 Issue 1, p38-45. 8p. DOI: [10.1002/xrs.2983](https://doi.org/10.1002/xrs.2983).

**Modern coin debasement discovered by combined portable X-ray fluorescence and atomic absorption spectroscopy in Peruvian cent coins (1950–1965).** Ortega-San-Martín, Luis; Sarango-Ramírez, Marvin K.; Galarreta, Betty C. *XRS: X-ray Spectrometry*. Feb/Mar2019, Vol. 48 Issue 1, p21-28. 8p. DOI: [10.1002/xrs.2980](https://doi.org/10.1002/xrs.2980).

**Novel anhydrous solid-state form of Azathioprine: The assessing of crystal structure by powder X-Ray diffraction, Infrared Absorption Spectroscopy and Raman scattering.** Covaci, Ovidiu -Ilie; Samohvalov, Dumitru; Manta, Corina -Mihaela; Buhalteanu, Lucian; Barbatu, Adrian; Baibarac, Mihaela; Daescu, Monica; Matea, Adelina; Gherca, Daniel. *Journal of Molecular Structure*. Feb2019, Vol. 1178, p702-710. 9p. DOI: [10.1016/j.molstruc.2018.10.065](https://doi.org/10.1016/j.molstruc.2018.10.065).

**In situ x-ray diffraction analysis of 2D crack patterning in thin films.** Faurie, D.; Zighem, F.; Godard, P.; Parry, G.; Sadat, T.; Thiaudière, D.; Renault, P.-O. *Acta Materialia*. Feb2019, Vol. 165, p177-182. 6p. DOI: [10.1016/j.actamat.2018.11.040](https://doi.org/10.1016/j.actamat.2018.11.040).

**Synthesis, spectroscopic studies, X-ray powder diffraction data and biological activity of mixed transition metal complexes with oxalato and theophylline ligands.** Bouhdada, M.; EL Amane, M.; Mohammed, B. Ba; Yamni, K. *Journal of Molecular Structure*. Feb2019, Vol. 1177, p391-400. 10p. DOI: [10.1016/j.molstruc.2018.09.047](https://doi.org/10.1016/j.molstruc.2018.09.047).

**Design optimisation of an energy-dispersive X-ray diffraction analyser.** O'Dwyer, Joel; Tickner, James. *Applied Radiation & Isotopes*. Feb2019, Vol. 144, p5-9. 5p. DOI: [10.1016/j.apradiso.2018.07.010](https://doi.org/10.1016/j.apradiso.2018.07.010).

**Deformation-induced phase transformation in a Co-Cr-W-Mo alloy studied by high-energy X-ray diffraction during in-situ compression tests.** Weißensteiner, Irmgard; Petersmann, Manuel; Erdely, Petra; Stark, Andreas; Antretter, Thomas; Clemens, Helmut; Maier-Kiener, Verena. *Acta Materialia*. Feb2019, Vol. 164, p272-282. 11p. DOI: [10.1016/j.actamat.2018.10.035](https://doi.org/10.1016/j.actamat.2018.10.035).

**Residual stress measurement by strain gauge and X-ray diffraction method in different shaped rails.** Turan, Muhammet Emre; Aydin, Fatih; Sun, Yavuz; Cetin, Melik. *Engineering Failure Analysis*. Feb2019, Vol. 96, p525-529. 5p. DOI: [10.1016/j.engfailanal.2018.10.016](https://doi.org/10.1016/j.engfailanal.2018.10.016).

