



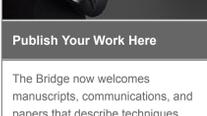
Multipurpose X-ray diffraction system with built-in intelligent guidance



SmartLab SE

A highly versatile multipurpose X-ray powder diffractometer with built-in intelligent guidance, SmartLab SE offers continued refinement of the ease-of-use features that enabled the original SmartLab to receive the R&D 100 Award in 2006: automatic alignment, component recognition, cross beam optics and an advanced photon counting hybrid pixel array detector (HPAD). **For more >**

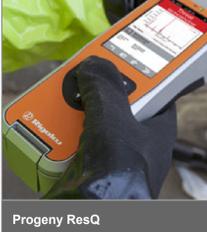
Interested in publishing your work in The Bridge?



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 send copy to the editor at Rigaku.newsletter@Rigaku.com

New generation in handheld chemical detection



Progeny ResQ

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

Video of the Month



For a Sustainable Future – Japan's Science and Technology Becoming a Bridge across the World

Japan contributes to the realization of the United Nations' sustainable development goals (SDGs) proposed for the betterment of the world. **Watch video >**

Conferences and Workshops



Join Rigaku at future meetings

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

Materials Research Society (MRS) Spring Meeting & Exhibit
Phoenix, AZ, USA
April 2 – 6, 2018

International Drug Enforcement Conference (RAD)
Rotterdam, The Netherlands
April 9 – 12, 2018

Analytica
Munich, Germany
April 10 – 13, 2018

See the complete list >

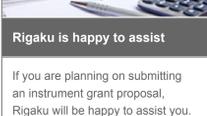
Useful Link of the Month



How to identify fonts in pictures

Have you ever looked at an image that includes text, and wondered what font is being used? This step by step guide from c/net teaches you how to identify fonts found in images or from a specified URL. **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 >**

Welcome

Thanks to everyone who took the time to come and talk to us at Pittcon 2018. As always, it was good to see everyone and have a chance to catch up. In April, Rigaku will attend about a dozen events worldwide (see full list). Of particular note are MRS Spring '18 in Phoenix, analytica '18 in Munich, and ExpoMin '18 in Santiago.

This month's issue contains three Rigaku Journal articles. The first is Part IX in a series exploring single crystal X-ray diffraction (XRD), while the second discusses a sample preparation method for XRF spectroscopy. The final article covers multi-dimensional analysis in powder XRD.



Rigaku's booth, at ARABLAB 2018, was designed to emphasize Japan for the Japan Pavilion

A special report on ARABLAB '18 is included. Application papers are also available for EDXRF, WDXRF, Raman and single crystal X-ray diffraction (SCX). The book review covers two books, one about crystallography while the other covers electron microscopy. Check out the news and papers sections at the bottom of the page for the latest developments in materials science.

R.C. Tisdale, Ph.D. – Editor

Featured Rigaku Journal Article

Introduction to single crystal X-ray analysis IX. Protein structure analysis and small molecule structure analysis
By Akihito Yamano, Rigaku Corporation

The previous series discussed single crystal X-ray analysis of small molecules. This series will discuss structure analysis of proteins using X-ray diffraction. The explanation will focus in particular on differences between structure analysis of proteins and that of small molecules. **Full article >**

Featured Rigaku Journal Article

Sample preparation for X-ray fluorescence analysis VIII. Liquid solidification method
By Kosuke Kawakyu, Rigaku Corporation

Sample preparation by liquid and droplet methods have been discussed in the previous installment of "Sample preparation for XRF analysis". In this issue, a novel preparation method by which liquid samples are solidified is described. Solidifying samples such as lubricating oils allows measurement to be performed in vacuum instead of helium and without the need of sample films. This is especially advantageous for the measurement of light elements, which have poor X-ray transmission rates through helium atmosphere and films. **Full article >**

Featured Rigaku Journal Article

Use of multi-dimensional measurement in powder X-ray diffraction
By Yukiko Namatame, Takahiro Kuzumaki, Yuji Shiramata and Keigo Nagao, Rigaku Corporation

In powder XRD measurements, the measurement mode (0D, 1D, 2D) and optical system are selected to suit the state of the sample and the purpose of the experiment. Until about 10 years ago, the typical approach was a 0D measurement using a scintillation counter (SC) combined with the Bragg-Brentano focusing method (BB optical system) or the parallel beam method. However, due to the development of semiconductor detectors, it became possible to also select 1D and 2D measurement, and the number of optical systems that can be used in combination is increasing every year. **Full article >**

Featured Event

ARABLAB 2018
Reported by Marketing Communication at Rigaku Corporation

ARABLAB, billed as the most powerful annual show for the global laboratory and analytical industry, is the largest B2B trade show for laboratory science and instrumentation in the Middle East. It is the buying and information platform for the most advanced technology in the fields of agriculture and food, biotechnology and life sciences, clinical diagnostics, drug discovery and development, energy and petrochemicals, forensics and security, laboratory technology, robotics and automation, etc. **Full report >**

WDXRF Application Note

Multiple Element Determination for Nickel Sulfide Ores by Pressed Powder Method on Simultix14
Rigaku Corporation

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

Raman Application Note

Rapid Identification of New Psychoactive Substances Using 1064 nm Handheld Raman
Rigaku Analytical Devices

Available through many sources, including the internet, new psychoactive substances (NPS) continue to rapidly emerge on the global market at an unprecedented rate. According to the World Health Organization (WHO), these substances pose "a threat to human health and well-being." Illegal or marketed as pure "legal highs", effects mimic traditional drugs. Global approval of newly identified NPS preparations is a growing challenge along with full knowledge of the health dangers and social ramifications. **For more >**

EDXRF Application Note

Analysis of Gemstones
Applied Rigaku Technologies

Elemental measurement is important in gemology for identification, classification and characterization of both natural and synthetic gemstones. Minor and trace levels of metals, especially the transition metals, as well as alkali elements and alkaline earth elements (such as Mg, K, Ca, Sr and Rb) help to establish the geographic region and environmental conditions during the formation of a gemstone. Other elements like Au and Pb can be used to indicate processing requirements of synthetics. **For more >**

Small Molecule Application Note

A study of the stereochemistry of sucrose and a phenidate derivative using the copper micro-focus source of the XtaLAB Synergy-i
Rigaku Oxford Diffraction

The XtaLAB Synergy-i is a cutting-edge diffractometer equipped with the latest detector technology (HyPix Bantam), optimized for its small pixel size and sensitivity, and can be configured with up to two bright micro-focus sealed tube X-ray sources. Herein, two datasets are presented and their results discussed. Both datasets were collected with the PhotonJet-Cu source. **For more >**

Book Review

High-Resolution Electron Microscopy, Fourth Edition by John C. H. Spence and **A Little Dictionary of Crystallography, 2nd Edition** edited by Andre Authier and Gervais Chapuis
Reviews by Joseph Ferrara, Deputy Director, X-ray Research Laboratory, Rigaku

The author of this textbook is the Richard Snell Professor of Physics at Arizona State University, a fellow of both the Royal Society and the ACA. The first edition was originally published in 1980. **Reviews >**

Material Analysis in the News

News for March 2018

March 1, 2018. Kazuharu Arakawa, a researcher at Tokyo's Keio University, picked up a tardigrade specimen when he was gathering samples from the parking lot of his apartment building in Tsuruoka-City, Japan. After finding the micro-animal and analyzing its DNA, Arakawa and his Polish colleagues reproduced the tiny tardigrade. What sets this [new species, Macrobiotus shonaiicus](#), apart from others is its chunky legs and bumpy eggs.

March 7, 2018. An ultrathin material consisting of two misaligned sheets of graphene can be easily [converted from being a Mott insulator to a superconductor](#). The surprising discovery, details of which were announced at the March meeting of the American Physical Society (APS), could lead to the development of materials with a range of engineered electronic properties.

March 7, 2018. [Topology hidden inside materials in the matter group called cerium mononitrides](#) has been determined for the first time in the world. A joint research group in Japan succeeded in observing the topological phase transition in which a material changes to the topological electronic phase by using soft X-rays, light suitable for determining the topology of materials by their substances rather than by their appearance.

March 16, 2018. A [novel quantum effect observed in a carbon nanotube film](#) could lead to the development of unique lasers and other optoelectronic devices, according to scientists at Rice University and Tokyo Metropolitan University. The Rice-Tokyo team reported an advance in the ability to manipulate light at the quantum scale by using single-walled carbon nanotubes as plasmonic quantum confinement fields.

March 20, 2018. Kagome is a popular style element in Japanese basket-making, characterized by a symmetrical pattern of interlaced triangles, whose lattice points each have four neighboring points. Theoretically, were a metal to have [atoms arranged in the same kagome pattern](#), it should display some peculiar electrical properties. Now, a mixed team of scientists at MIT, Harvard University, and Lawrence Berkeley National Laboratory did just that, and the product does indeed showcase exotic physics.

March 20, 2018. A [new type of solar cell that is thin like plastic film](#) and cheap to produce is expected to hit the market within the next two years. The perovskite solar cell is expected to become a standard along with the silicon solar cells that are commonly used today. The cells' development was announced in 2009 by professor Tsutomu Miyasaka at Toin University of Yokohama.

March 21, 2018. Honored Japanese geochemist [Katsuko Saruhashi on her 98th birthday](#) with a doodle. Dr. Katsuko is widely known for two research projects. She was one of the first to study and measure the levels of carbon dioxide in seawater. Her methodology came to be known as 'Saruhashi's Table' and was widely used by oceanographers.

Recent Scientific Papers of Interest

Papers for March 2018

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

Sodium storage mechanisms of bismuth in sodium ion batteries: An operando X-ray diffraction study. Gao, Hui; Ma, Wensheng; Yang, Wanfeng; Wang, Jiawei; Niu, Jiazheng; Luo, Fakui; Peng, Zhongquan; Zhang, Zhonghua. *Journal of Power Sources*. Mar2018, Vol. 379, p1-9. Pp. DOI: [10.1016/j.jpowsour.2018.01.017](https://doi.org/10.1016/j.jpowsour.2018.01.017).

Determination of crystal size distributions in alumina ceramics by a novel X-ray diffraction procedure. Neher, Sigmund H.; Klein, Helmut; Kuhs, Werner F. *Journal of the American Ceramic Society*. Mar2018, Vol. 101 Issue 3, p1381-1392. 12p. DOI: [10.1111/jace.15309](https://doi.org/10.1111/jace.15309).

Analysis of 19th century ceramic fragments excavated from Pirenópolis, Goiás, Brazil) using FT-IR, Raman, XRF and SEM. Freitas, Renato P.; Coelho, Filipe A.; Felix, Valter S.; Pereira, Marcelo O.; de Souza, Marcos André Torres; Marcolino J. *Spectrochimica Acta Part A: Molecular & Biomolecular Spectroscopy*. Mar2018, Vol. 193, p432-439. 8p. DOI: [10.1016/j.saa.2017.12.047](https://doi.org/10.1016/j.saa.2017.12.047).

Distinction and quantification of inorganic sulfur species including thiosulfate by X-ray fluorescence (WD-XRF). Hennings, Stephanie; Plešow, Alexander. *XRF: X-ray Spectrometry*. Mar/Apr2018, Vol. 47 Issue 2, p144-152. 9p. DOI: [10.1002/xrs.2823](https://doi.org/10.1002/xrs.2823).

From macro to micro: An advanced macro X-ray fluorescence (MA-XRF) imaging approach for the study of painted surfaces. Sciutto, G.; Frizzi, T.; Catelli, E.; Aresi, N.; Prati, S.; Alberti, R.; Mazzeo, R. *Microchemical Journal*. Mar2018, Vol. 137, p277-284. 8p. DOI: [10.1016/j.microc.2017.11.003](https://doi.org/10.1016/j.microc.2017.11.003).

Direct determination of calcium and phosphorus in mineral supplements for cattle by wavelength dispersive X-ray fluorescence (WD-XRF). Babos, Diego Victor; Costa, Vinícius Câmara; Sperança, Marco Aurelio; Pereira-Filho, Edeir Rodrigues. *Microchemical Journal*. Mar2018, Vol. 137, p272-276. 5p. DOI: [10.1016/j.microc.2017.11.002](https://doi.org/10.1016/j.microc.2017.11.002).

Analysis of Serra d'Alto figuline pottery (Matera, Italy): Characterization of the dark decorations using XRF. Angeli, L.; Legnaioli, S.; Fabbri, C.; Grifoni, E.; Lorenzetti, G.; Guilaime, J.; Palleschi, V.; Radi, G. *Microchemical Journal*. Mar2018, Vol. 137, p174-180. 7p. DOI: [10.1016/j.microc.2017.10.014](https://doi.org/10.1016/j.microc.2017.10.014).

Development of a prototype hybrid L-edge/L-XRF densitometer for nuclear fuel assay. Joong, Sungyeop; Park, Seunghoon. *Applied Radiation & Isotopes*. Mar2018, Vol. 133, p81-84. 4p. DOI: [10.1016/j.apradiso.2017.12.022](https://doi.org/10.1016/j.apradiso.2017.12.022).

Different beta-alanine dimeric forms in trifluoromethanesulfonic acid salts. XRD and vibrational studies. Woloszyn, Lukasz; Ilcyszyn, Maria M. *Spectrochimica Acta Part A: Molecular & Biomolecular Spectroscopy*. Mar2018, Vol. 193, p156-168. 13p. DOI: [10.1016/j.saa.2017.12.018](https://doi.org/10.1016/j.saa.2017.12.018).

Solid-state one-way photoisomerisation of Z,E,Z'-1,6-(4,4'-diphenyl)hexa-1,3,5-triene dicarboxylate examined using higher-order derivative spectra and powder XRD patterns. Sonoda, Yoriko; Goto, Midori; Ichimura, Kunihiro. *Photochemical & Photobiological Sciences*. Mar2018, Vol. 17 Issue 3, p271-280. 10p. DOI: [10.1039/c7pp00247e](https://doi.org/10.1039/c7pp00247e).

New model of ethylene glycol intercalate in smectics for XRD determination. Szczerba, Marek; Ufer, Kristian. *Applied Clay Science*. Mar2018, Vol. 153, p113-123. 11p. DOI: [10.1016/j.clay.2017.12.010](https://doi.org/10.1016/j.clay.2017.12.010).

Measurement and characterization of X-ray diffraction study on Zn-doped maize starch granules using ATR-FTIR and XRD. Chen, Long; Tian, Yaoqi; Sun, Binghua; Cai, Canxin; Ma, Rongrong; Jin, Zhengyu. *Food Chemistry*. Mar2018, Vol. 242, p131-138. 8p. DOI: [10.1016/j.foodchem.2017.09.018](https://doi.org/10.1016/j.foodchem.2017.09.018).

Investigation on surface layer characteristics of shot peened graphene reinforced Al composite by X-ray diffraction method. Zhan, Ke; Wu, Yihao; Li, Jiongli; Zhao, Bin; Yan, Ya; Xie, Lechun; Wang, Lianbo; Ji, V. *Applied Surface Science*. Mar2018, Vol. 435, p1257-1264. 8p. DOI: [10.1016/j.apsusc.2017.11.242](https://doi.org/10.1016/j.apsusc.2017.11.242).

Correlational study of halogen tuning effect in hybrid perovskite single crystals with Raman scattering, X-ray diffraction, and absorption spectroscopy. Lee, A Young; Park, Daeg Young; Jeong, Mun Seok. *Journal of Alloys & Compounds*. Mar2018, Vol. 738, p239-245. 7p. DOI: [10.1016/j.jallcom.2017.12.149](https://doi.org/10.1016/j.jallcom.2017.12.149).

Multivariate calibration of energy-dispersive X-ray diffraction data for predicting the composition of pharmaceutical tablets in packaging. Crews, Chiaki; O'Flynn, Daniel; Speller, Robert D.; Kenny, Peter S. *Journal of Pharmaceutical & Biomedical Analysis*. Mar2018, Vol. 151, p186-193. 8p. DOI: [10.1016/j.jpba.2017.12.036](https://doi.org/10.1016/j.jpba.2017.12.036).

The effect of helium implantation on the deformation behavior of tungsten: X-ray micro-diffraction and nanoindentation. Das, S.; Armstrong, D.E.J.; Zayachuk, Y.; Liu, W.; Xu, R.; Hofmann, F. *Scripta Materialia*. Mar2018, Vol. 146, p335-339. 5p. DOI: [10.1016/j.scriptamat.2017.12.014](https://doi.org/10.1016/j.scriptamat.2017.12.014).

Microstructure Characterization of Multilayer Thin Coatings ZrN/Si₃N₄ by X-Ray Diffraction Using Noncoplanar Measurement Geometry. Vlasenko, Svetlana; Beneditkovich, Andrei; Ulyanenko, Alex; Uglov, Vladimir; Abadias, Grégory; O'Connell, Jacques; van Vuuren, Arno Janse. *Physica Status Solidi: A: Applications & Materials Science*. 3/7/2018, Vol. 215 Issue 5, p1-9. 9p. DOI: [10.1002/pssa.201700670](https://doi.org/10.1002/pssa.201700670).

High-resolution in-situ X-ray diffraction study on Zn-doped magnetite nanoparticles. Ferrari, S.; Bilovol, V.; Pampillo, L.G.; Grimblat, F.; Errandonea, D. *Solid State Sciences*. Mar2018, Vol. 77, p1-4. 4p. DOI: [10.1016/j.solidststatesciences.2018.01.002](https://doi.org/10.1016/j.solidststatesciences.2018.01.002).

Determination of silver nanoparticles in complex aqueous matrices by total reflection X-ray fluorescence spectrometry combined with cloud point extraction. Torrent, Laura; Iglesias, Mónica; Hidalgo, Manuela; Margui, Eva. *JAAS (Journal of Analytical Atomic Spectrometry)*. Mar2018, Vol. 33 Issue 3, p383-394. 12p. DOI: [10.1039/c7ja00332c](https://doi.org/10.1039/c7ja00332c).

Total reflection X-ray fluorescence as a convenient tool for determination of trace elements in microscale gasoline and diesel. Zhang, Aiqi; Jin, Axiang; Wang, Hai; Wang, Xiaokang; Zha, Pengfei; Wang, Meiling; Song, Xiaoping; Gao, Sitian. *Spectrochimica Acta Part B: Mar2018*, Vol. 141, p7-14. 8p. DOI: [10.1016/j.sab.2017.12.008](https://doi.org/10.1016/j.sab.2017.12.008).