



PHOTO BY MASAYUKI WATANABE FROM YAMANAKHI FACTORY

橋 THE BRIDGE
MATERIALS ANALYSIS eNEWSLETTER
NOVEMBER 2017, ISSUE 53

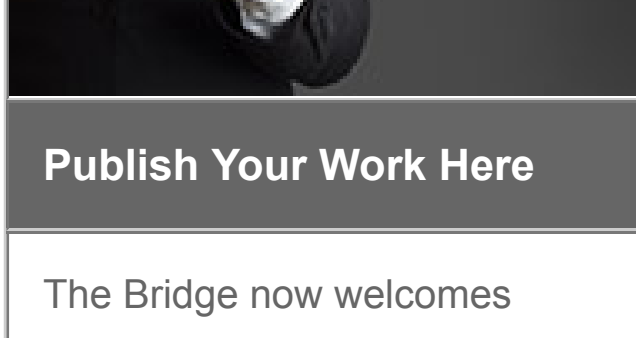
Non-destructive measurement of particle size and size distribution



NANOPIX mini

Rigaku NANOPIX mini is the world's first benchtop small angle X-ray scattering (SAXS) system that is engineered to deliver automatic nanoparticle size distribution analysis for both quality control (QC) and research and development (R&D) applications. Nanoparticle size, size distribution, and particle shape are the key pieces of information obtained from SAXS. Samples may range from solutions, suspensions or slurries to solid plastics, rubbers or polymers. **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

Elemental analysis of solids, 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 (LOD). **For more >**

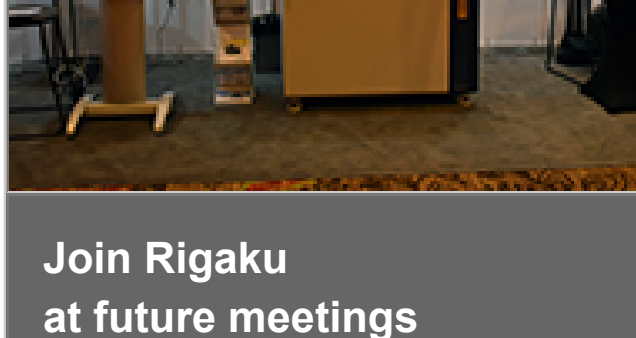
Video of the Month



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

Japan contributes to the realization of the United Nation's sustainable development goals (SDGs) proposed for the betterment of the world. Video message from The Ministry of Foreign Affairs Japan. **Watch video >**

Conferences and Workshops



Join Rigaku at future meetings

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

- American Geophysical Union (AGU 2017)**
New Orleans, LA, USA
December 12 – 16, 2017
- Gulf Coast Conference (GCC) 2017**
Houston, TX, USA
January 17 & 18, 2017
- AWA Global Release Liner Industry Conference & Exhibition**
Amsterdam, Netherlands
February 14 – 16, 2017

See the complete list >

Useful Link of the Month



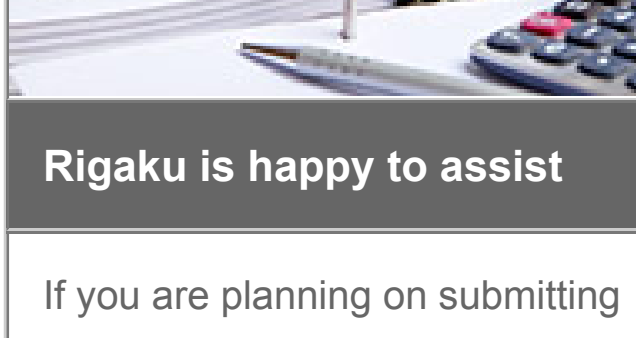
The plotutils Package

The GNU plotutils package contains software for both programmers and technical users. Its centerpiece is libplot, a powerful C/C++ function library for exporting 2-D vector graphics in many file formats, both vector and bitmap. On the X Window System, it can also do 2-D vector graphics animations.

libplot is device-independent, in the sense that its API (application programming interface) does not depend on the type of graphics file to be exported. A Postscript-like API is used both for file export and for graphics animations. A libplot programmer needs to learn only one API: not the details of many graphics file formats.

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

The eNewsletter is early this month due to the Thanksgiving holiday in the US. Thanks again to everyone who came by our booths at AAPS in San Diego and EAS in Princeton, NJ this month. It was great to see everyone and to have the chance to talk about our new and exciting products. We look forward to seeing many of you at the MRS conference in Boston at the end of the month and at the American Geophysical Union (AGU) conference in New Orleans next month.



RESE Grand Opening Toast of New Facility on 8 November 2017

As of November 8, Rigaku Europe SE (RESE) opened its new headquarters in Neu-Isenburg, Germany. Located a short bus ride from the Frankfurt International Airport, the new office is home to a large and well-equipped application development and demonstration facility, complete with extensive sample preparation and wet chemistry labs. Having had the privilege of attending and participating in the opening ceremony, we are confident that all who visit RESE will be suitably impressed. A formal report is included below.

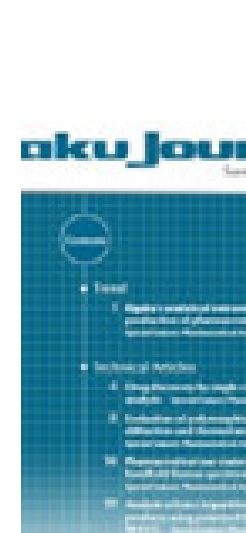
This month's issue contains a *Rigaku Journal* article describing the new SmartLab Studio II integrated XRD software package. In addition, a special report is included on the recently concluded 6th World Customs Organization Technology & Innovation Forum.

Application papers are also included for TXRF, EDXRF, WDXRF, and XRD. Five short book reviews are included this month concerning a variety of interesting topics. Check out the news, book review and papers sections for the latest developments in materials science.

R.C. Tisdale, Ph.D. – Editor

Featured Rigaku Journal Article

Integrated X-ray diffraction software: SmartLab Studio II
Rigaku Corporation

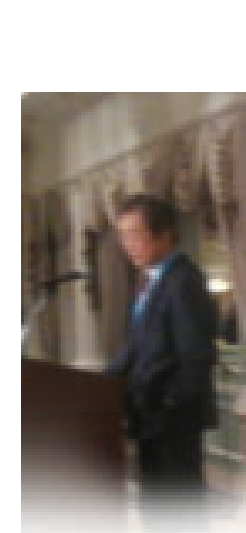


SmartLab Studio II is an integrated X-ray diffraction software package for making both measurements and analyses using SmartLab, an automated multipurpose X-ray diffractometer. Two years ago, the user guidance feature, flow bars, chart control, report manager, SQL database, and plugin modules were introduced. Now we would like to announce several new features of SmartLab Studio II for the SmartLab SE system which was launched to the market in April, 2017.

Full article >

Featured Rigaku Journal Article

Nanoscale X-ray structural characterization instrument: NANOPIX
Rigaku Corporation



SAXS (Small Angle X-ray Scattering) is a powerful tool for nano-scale structural analysis covering a broad range of applications from research and development to quality control. The technique targets a broad range of materials, from periodic and non-periodic structures including solid, liquid, liquid crystal and gels to research in advanced functional materials such as carbon fiber reinforced plastics (CFRP), nano-particle (NP) sizing, and coarse-structure analysis of macromolecules. Advanced functional materials, used increasingly in today's nanotechnology-focused research, have nanoscale fine structural features that must be well-controlled. **Full article >**

Featured Event

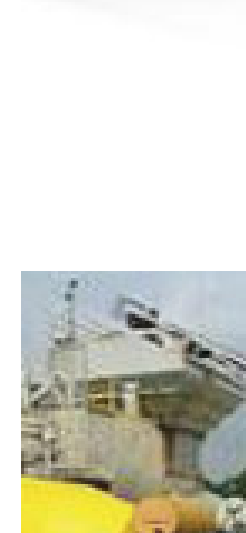
The 6th World Customs Organization Technology & Innovation Forum
Reported by Mitsuhiro Tomobuchi, Manager, Portable Analyzer Division, Rigaku Corporation



Rigaku Corporation participated in the 6th World Customs Organization Technology & Innovation Forum as a Diamond Sponsor from Oct 31 to Nov 2, 2017. The forum is an international exhibition, and about 500 people related to customs processes, such as governmental officers, attended a variety of sessions. **Full report >**

Featured Event

International Sales Meeting 2017
Reported by Akito Sasaki and Yuji Shiramata, Rigaku Corporation



Between 40 and 50 people from various Rigaku distributors in European countries met in Neu-Isenburg, Germany from November 7th through 9th, 2017. This annual international sales meeting was held at the new Rigaku Europe SE office, which has been open in its new location for about a month. Attendees were very pleased with the location because Neu-Isenburg is very close to Frankfurt International Airport, taking just 15 minutes by car! **Full report >**

XRD Application Note

Temperature-controlled XRD measurement using MiniFlex with 2D detector and BTS 500
Rigaku Corporation



The MiniFlex benchtop X-ray diffractometer can be used with the HyPix-400 MF high-speed two-dimensional detector and the BTS 500 temperature-control attachment (manufactured by Anton Paar), which enables measurements from room temperature to 500°C. With this desktop system, you can observe a phase transition of a substance due to temperature change in real time. **For more >**

WDXRF Application Note

Cement Analysis by the Pressed Powder Method on the ZSX PrimusIII+ According to ASTM C114-11
Rigaku Corporation



Cement is one of the most important materials for construction. Many kinds of hydraulic cements, including Portland cement, with various physical properties are produced by changing the composition of clinker minerals; therefore, it is important to control the chemical composition of cement products and interim products. **For more >**

EDXRF Application Note

Analysis of Glass & Raw Materials
Applied Rigaku Technologies



Soda-lime glass makes up 90% of the global glass production and is used to make windows, glassware and bottles. Common raw materials include sodium carbonate (soda), calcium carbonate (limestone), calcium oxide (lime), dolomite, alumina, slags and sand. Raw materials must be screened and mixed properly to give the desired glass properties for the finished products. Rigaku NEX CG meets these measurements needs in a simple to use benchtop system, ideally designed for the at-line non-technical QC technician and the advanced technical user alike. **For more >**

Rigaku Oxford Diffraction Application Note

High Pressure Crystallography
Rigaku Oxford Diffraction



The study of crystalline samples under pressure is increasing in popularity due to the capabilities of modern X-ray diffractometers and the increased availability of synchrotron facilities. Rigaku Oxford Diffraction's systems and CrysAlis^{Pro} software are particularly well-suited to high pressure crystallography, with a range of features designed to make experiments straightforward and accessible to the wider crystallographic community. In this application note, work carried out with Prof. Sandy Blake of the University of Nottingham is presented. **For more >**

Book Review

Soonish: Ten Emerging Technologies That'll Improve and/or Ruin Everything
by Kelly and Zach Weinersmith, Penguin Press, New York, 2017, 368 pages, ISBN: 978-0399563829



Reviewed by Jeanette S. Ferrara, MA

Soonish is a marriage of science fact and science humor, which makes sense, given that the authors, a scientist and a comic strip creator, are married. They divided the book into three sections: the universe, stuff, and you. Translation: space exploration, gadgets and robots, and human biology. **Full review >**

Material Analysis in the News

News for November 2017



November 1, 2017. A plasma cocoon lets growing stars keep their X-rays to themselves. Laboratory experiments that mimic marshy stars show that streams of plasma splash off a star's surface, forming a veil that keeps certain kinds of radiation inside. That coating could explain a puzzling mismatch between X-ray and ultraviolet observations of growing stars.

November 2, 2017. In addition to developing a new, informatics-based tyre design technology, Yokohama Rubber says it has established a development technology for rubber materials based on materials informatics. The new technology employs artificial intelligence to search through the vast amount of data arising from numerous simulation results. The use of artificial intelligence makes it possible to derive the morphological design factors critical to achieving the desired performance and the related thresholds (limitation values) in a short period of time and with a high degree of objectivity and quantitative accuracy.

November 6, 2017. Researchers at Tohoku University in Japan have gleaned insights into how liquids turn into glass by studying an organic metal material. In this study, a multi-institutional Japanese team, led by Dr. Kenichiro Hashimoto of the Institute for Materials Research, compared the molecular dynamics of glass formation in conventional liquids, such as a glucose solution, to an organic metal material containing 'frustrated' electrons.

November 8, 2017. Researchers at Tokyo Metropolitan University have recently discovered a novel layered superconductor containing tin (Sn) and arsenic (As) as its major components. The layered superconducting material is characterized by a crystal structure in which a SnAs layer (wherein Sn and As are two-dimensionally bonded to develop superconductivity) and a Na layer (the spacer layer) are alternately laminated.

November 8, 2017. Truly functional MOFs are on the horizon but Prof. Susumu Kitagawa (Kyoto University) saw their potential when they were weak and idle. A *Chemistry World* author caught up with him at the 24th Congress of the International Union of Crystallography in Hyderabad this August for an in-depth interview.

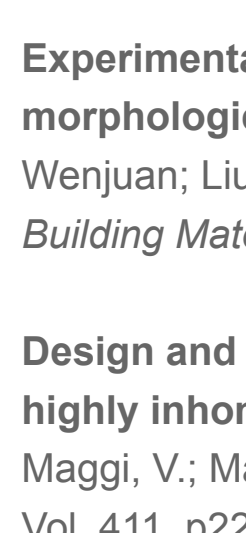
November 9, 2017. A Japanese-led international team of astrophysicists has used nearly two years of observations made by CALET, a cosmic ray detector onboard the International Space Station (ISS), to capture the highest-energy electrons and positrons ever directly detected in space (up to 3 TeV).

November 10, 2017. Former SLAC Director Jonathan Dorfan was awarded Japan's "Order of the Rising Sun." The award honors his contributions to research and education as founding president of the Okinawa Institute of Science and Technology Graduate University (OIST).

November 13, 2017. Scientists from RIKEN in Japan have discovered interesting new magnetic properties of a type of materials known as "quantum spin ice." These materials demonstrate interesting properties as they behave as "frustrated magnets" – systems that can settle into various magnetic states because of their special geometry. One important property of these materials is that they have virtual monopoles.

November 17, 2017. One of Japan's largest research institutes, Riken, will try converting the radioactive elements of nuclear waste into a precious metal. The trial will shoot deuteron beams at palladium-107, a radioactive isotope, to try and convert it into palladium-106, a precious metal commonly used in the catalytic converters of automobiles.

Recent Scientific Papers of Interest



Papers for November 2017

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

Small-angle X-ray scattering (SAXS) studies of the structure of mesoporous silicas. Zie niewicz-Strzałka, M.; Skibińska, M.; Pikus, S. *Nuclear Instruments & Methods in Physics Research Section B*. Nov2017, Vol. 411, p72-77. 6p. DOI: [10.1016/j.nimb.2017.03.028](https://doi.org/10.1016/j.nimb.2017.03.028).

On-stream mineral identification of tailing slurries of an iron ore concentrator using data fusion of LIBS, reflectance spectroscopy and XRF measurement techniques. Khajehzadeh, Navid; Haavisto, Olli; Koresaar, Lauri. *Minerals Engineering*. Nov2017, Vol. 113, p83-94. 12p. DOI: [10.1016/j.mineng.2017.08.007](https://doi.org/10.1016/j.mineng.2017.08.007).

Operando XRD studies as a tool for determination of transport parameters of mobile ions in electrode materials. Kondracki, Lukasz; Kulka, Andrzej; Swierczek, Konrad; Ziąbka, Magdalena; Molenda, Janina. *Journal of Power Sources*. Nov2017, Vol. 369, p1-5. 5p. DOI: [10.1016/j.jpowsour.2017.09.072](https://doi.org/10.1016/j.jpowsour.2017.09.072).

Experimental investigation of the relationship between mineral content and aggregate morphological characteristics using the improved FTI system and XRD method. Sun, Wenjuan; Liu, Yufeng; Lane, D. Stephen; Nair, Harikrishnan; Wang, Linbing. *Construction & Building Materials*. Nov2017, Vol. 155, p981-991. 11p. DOI: [10.1016/j.conbuildmat.2017.08.065](https://doi.org/10.1016/j.conbuildmat.2017.08.065).

Experimental investigation of the relationship between mineral content and aggregate morphological characteristics using the improved FTI system and XRD method. Sun, Wenjuan; Liu, Yufeng; Lane, D. Stephen; Nair, Harikrishnan; Wang, Linbing. *Construction & Building Materials*. Nov2017, Vol. 155, p981-991. 11p. DOI: [10.1016/j.conbuildmat.2017.08.065](https://doi.org/10.1016/j.conbuildmat.2017.08.065).

Design and characterization of a novel device optimized to collect XRD patterns from highly inhomogeneous and low density powder samples. D'Elia, A.; Cibir, G.; Robbins, P.E.; Maggi, V.; Marcelli, 7p. DOI: [10.1016/j.nimb.2017.03.061](https://doi.org/10.1016/j.nimb.2017.03.061).

Microbialite Biosignature Analysis by Mesoscale X-ray Fluorescence (μXRF) Mapping. Tice, Michael M.; Quezergue, Kimbra; Pope, Michael C. *Astrobiology*. Nov2017, Vol. 17 Issue 11, p1161-1172. 12p. DOI: [10.1089/ast.2016.1494](https://doi.org/10.1089/ast.2016.1494).

Vacancy-assisted oxygen reduction reaction on XRD-based catalysts in direct He vanadide fuel cell revealed by in-situ XAFS and XRD. Wang, Juan; Lin, Longxia; He, Yan; Qin, Haiying; Yan, Shuai; Yang, Ke; Li, Aiguo; Liu, Jiabin. *Electrochimica Acta*. Nov2017, Vol. 254, p72-78. 7p. DOI: [10.1016/j.electacta.2017.09.102](https://doi.org/10.1016/j.electacta.2017.09.102).

WAXD/SAXS study and 2D fitting (SAXS) of the microstructural evolution of PAN-based carbon fibers during the pre-oxidation and carbonization process. Li, Xiao-Yun; Tian, Feng; Gao, Xue-Ping; Bian, Feng-Gang; Li, Xiu-Hong; Wang, Jie. *Carbon*. Nov2017, Vol. 124, p722-723. 2p. DOI: [10.1016/j.carbon.2017.05.016](https://doi.org/10.1016/j.carbon.2017.05.016).

Determination of mass absorption coefficient in two-layer thin-film Cr/V and V/Cr systems by X-ray fluorescence spectrometry. Mashin, N.; Krylov, E.; Chernyayeva, E.; Ershov, A.; Zimina, E. *Journal of Analytical Chemistry*. Nov2017, Vol. 72 Issue 11, p1167-1171. 5p. DOI: [10.1134/S1061934817090064](https://doi.org/10.1134/S1061934817090064).

Applying the X-ray diffraction analysis for estimating the height and width of nanorods in low symmetry crystal multiphase materials. Mokhtari, Ali; Soleimani, Vahdat; Dehkordi, Hamed Alebrahim; Dastafkan, Kamran. *Journal of Crystal Growth*. Nov2017, Vol. 478, p58-63. 6p. DOI: [10.1016/j.jcrysgro.2017.08.026](https://doi.org/10.1016/j.jcrysgro.2017.08.026).

Thickness determination of TiN and TiAl coatings on steel substrates using X-ray diffraction method and their composition measurements by GD-OES. Ailaj, Fisnik R.; Sylva, Naim; Oettel, Heinrich; Dilo, Teuta. *Surface & Interface Analysis: SIA*. Nov2017, Vol. 49 Issue 11, p1135-1141. 7p. DOI: [10.1002/sia.6292](https://doi.org/10.1002/sia.6292).

A nested multivariate chemometrics based calibration strategy for direct trace biometal analysis in soft tissue utilizing Energy Dispersive X-Ray Fluorescence (EDXRF) and scattering spectrometry. Okonda, J.J.; Angeyo, K.H.; Mangala, J.M.; Kisia, S.M. *Applied Radiation & Isotopes*. Nov2017, Vol. 129, p49-56. 8p. DOI: [10.1016/j.apradiso.2017.08.008](https://doi.org/10.1016/j.apradiso.2017.08.008).

Improved Rayleigh to Compton scattering ratio curves for mass attenuation coefficients determination for X-ray fluorescence analysis. Conti, C.C.; Anjos, M.J.; Salgado, C.M. *XRS: X-ray Spectrometry*. Nov/Dec2017, Vol. 46 Issue 6, p522-528. 7p. DOI: [10.1002/xrs.2790](https://doi.org/10.1002/xrs.2790).

The amorphization of 3C-SiC irradiated at moderately elevated temperatures as revealed by XRD. Bouille, A.; Debelle, A.; Wallace, J.B.; Bayu Aji, L.B.; Kucheyev, S.O. *Acta Materialia*. Nov2017, Vol. 140, p250-257. 8p. DOI: [10.1016/j.actamat.2017.08.030](https://doi.org/10.1016/j.actamat.2017.08.030).

The energy dispersive scheme of X-ray fluorescence analysis with a crystal polarizer and polycapillary optics. Turyanskiy, A.G.; Gizha, S.S.; Senkov, V.M.; Stanishevskiy, Ya.M. *XRS: X-ray Spectrometry*. Nov/Dec2017, Vol. 46 Issue 6, p548-553. 6p. DOI: [10.1002/xrs.2794](https://doi.org/10.1002/xrs.2794).

Comparison of residual stress determination using different XRD planes by short-wavelength X-ray diffraction in a friction-stir-welded aluminum alloy plate. Ji, Pengfei; Zhang, Jin; Zheng, Lin; Xiao, Yong; Dou, Xiaohua; Cui, Xiaoming; Lian, Yong. *Journal of Materials Science*. Nov2017, Vol. 52 Issue 21, p12834-12847. 14p. DOI: [10.1007/s10853-017-1321-1](https://doi.org/10.1007/s10853-017-1321-1).

Pt oxide and oxygen reduction at Pt(111) studied by surface X-ray diffraction. Dmec, Jakub; Ruge, Martin; Reikowski, Finn; Rahn, B.; Björn, Francesco; Felici, Roberto; Stettner, Joachim; Magnusson, Olaf M.; Harrington, David A. *Electrochemistry Communications*. Nov2017, Vol. 84, p50-52. 3p. DOI: [10.1016/j.elecom.2017.10.002](https://doi.org/10.1016/j.elecom.2017.10.002).

A simple method for the multi-elemental analysis of beer using total reflection X-ray fluorescence. Gama, Ednilton M.; Nascentes, Clésia C.; Matos, Roberta P.; Rodrigues, Gabrielle de C.; Rodrigues, Guilherme D. *Talanta*. Nov2017, Vol. 174, p274-278. 5p. DOI: [10.1016/j.talanta.2017.05.059](https://doi.org/10.1016/j.talanta.2017.05.059).