

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 (LLD). **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.

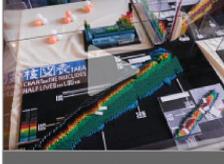
Benchtop chemical crystallography system for 3D small molecule structure determination



XtaLAB mini II

The Rigaku XtaLAB mini II benchtop X-ray crystallography system is a compact single crystal X-ray diffractometer designed to produce publication-quality 3D structures. The perfect addition to any synthetic chemistry laboratory, the XtaLAB mini II will enhance research productivity by offering affordable structure analysis capability without the necessity of relying on a departmental facility. With the XtaLAB mini II, you no longer have to wait in line to determine your structures. Instead your research group can rapidly analyze new compounds as they are synthesized in the lab. **For more >**

Video of the Month



The Advanced Science Research Center (ASRC) at the Japan Atomic Energy Agency (JAEA)

The Advanced Science Research Center (ASRC) is a fundamental science research institute that conducts frontier research and development in the National Institute, Japan Atomic Energy Agency (JAEA). In order to solve today's problems and to meet future challenges, ASRC promotes cutting-edge nuclear and materials science research by making maximum use of the advantages of JAEA. With leading-edge projects in different fields, and with complementary viewpoints, researchers at ASRC explore new paths leading to far-reaching scientific discoveries and innovative solutions for the dawn of a bright future. **Watch video >**

Conferences and Workshops



Join Rigaku at future meetings

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

International Small Angle Scattering Conference (SAS 2018)
Traverse City, MI, US
October 7 – 12, 2018

Materials Science & Technology (MS&T) 2018
Columbus, OH, US
October 14 – 18, 2018

Gulf Coast Conference (GCC) 2018
Galveston, TX, US
October 17 – 18, 2018

See the complete list >

Useful Link of the Month

xrayutilities
A package with useful scripts for X-ray diffraction physicists

Download | **Get Updates**

Windows | Mac | Linux

xrayutilities is a python package used to analyze X-ray diffraction data. It can assist with performing diffraction experiments and can be used for common steps in the data analysis. It can read experimental data from several data formats (spec, edf, xrdml, ...); convert them to reciprocal space for arbitrary goniometer geometries and different detector systems (point, linear as well as area detectors). For further processing the data can be regular (transformed to a grid grid). **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

For all who came to see us exhibit the latest in X-ray analytical instrumentation at the annual Japan Analytical & Scientific Instruments Show (JASIS), we thank you for your time and interest. In October, there are several events of note, including the International Small Angle Scattering (SAS) conference (Traverse City, MI, Oct. 7 – 12, Booths #7 – 9), the Materials Science & Technology (MS&T) conference (Columbus, OH, Oct. 14 – 18, Booth #427) and the Gulf Coast Conference (GCC). We are pleased to report that the GCC returns to its old venue at the Moody Gardens Convention Center (Galveston, TX, Oct. 16 – 17, Booths #106 and #122). A complete list of events may be found [here](#).

This month's issue contains two featured articles and an event. The first article discusses the Graphite/Graphene Analytical Index, while the second is a customer paper entitled *Jack Of All Trades, Microgel*. The featured event is the 12th European Symposium on Thermal Analysis and Calorimetry.

This month's featured WDXRF technical note discusses a geological application, the quantitative analysis of dolomite and limestone. For EDXRF, the application note discusses the measurement of titanium coatings on steel.

The book review covers *Biological Small Angle Scattering: Theory and Practice*. The link of the month opens "xrayutilities – a package with useful scripts for X-ray diffraction physicists." Check out the video covering the Advanced Science Research Center (ASRC) at the Japan Atomic Energy Agency (JAEA). 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 Article

Graphite/Graphene Analytical Index: GG Index

By Dr. Akito Sasaki, Rigaku Corporation

The GG Index is an analytical tool for the characterization and identification of graphite-based carbon materials, covering natural graphite, artificial graphite and carbon black from petro or coal derivatives, expanded graphite, graphite/graphene oxides, graphene intermediates, graphene, etc. The GG Index runs on Rigaku's SmartLab 9 kW X-ray diffractometer. **Full article >**



Featured Customer Article

Jack Of All Trades, Microgel

By Andrea Melle and Walter Richtering, RWTH Aachen University

Since 2012, scientists from different disciplines have worked together within the Collaborative Research Centre "Functional Microgels and Microgel Systems" (CRC 985) to investigate the unique properties of "microsponges", so called microgels. Natural scientists, engineers and medical scientists from RWTH, the University Hospital Aachen, the DWI-Leibniz-Institute for Interactive Materials and Forschungszentrum Jülich are cooperating within 15 individual research projects to make use of the outstanding potential of functional microgels. **Full article >**

[Read article in native format: Tausendssassa Mikrogel >](#)



Featured Event

12th European Symposium on Thermal Analysis and Calorimetry

Reported by Dr. Lani Celiz, Applications Laboratory, Thermal Analysis Division, Rigaku Corporation

The European Symposium of Thermal Analysis (ESTAC), held every four years, is organized by the Central and Eastern European Committee for Thermal Analysis and Calorimetry (CEEC-TAC). The first ESTAC conference took place in 1976 in Salford, England. This year, the 12th European Symposium on Thermal Analysis and Calorimetry (ESTAC12) was held in Aula Sergiu Chiriacescu at the Transilvania University of Brasov. **Full report >**



WDXRF Application Note

Quantitative Analysis of Dolomite and Limestone by Pressed Powder Method with Supermini200

Rigaku Corporation

Both dolomite and limestone are important mineral resources used in various industries such as cement, electronics, iron manufacturing, glass, paper and pulp, agriculture. Each industry has particular interests in contents and components. XRF analysis quickly and easily offers precise elemental analysis results allowing control of the components in the product during the manufacturing process. **For more >**

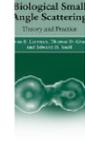


EDXRF Application Note

Titanium on Steel

Applied Rigaku Technologies

Aluminum and steel are often coated with a protective conversion coating, also called passivate or passivation coating, to prevent oxidation and corrosion of the base metal. Conversion coatings include Cr, Ti, V, Mn, Ni, or Zr. A phosphate coating may be applied as well to minimize wear on cutting tools and stamping machines. Aluminum is often coated for use in aircraft parts, aluminum window frames and other similar industries where the aluminum is exposed to weathering. Steel for the automotive industry is typically first galvanized with a zinc coating before the conversion coating is applied. **For more >**

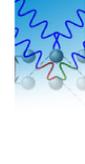


Book Review

Biological Small Angle Scattering: Theory and Practice

Review by Joseph Ferrara, Deputy Director, X-ray Research Laboratory, Rigaku

Although I've reviewed at least one other book on small angle scattering (SAS), this volume really addresses the current theory and practice with sufficient detail for a skilled scientist to successfully begin a study in biological small angle scattering. The book is divided into five parts. **Read review >**



Material Analysis in the News

News for September 2018

September 1, 2018. Materials scientists, led by Prof. Y. Yang at the UCLA Samueli School of Engineering, have developed a [highly efficient thin-film solar cell](#) that generates more energy from sunlight than typical solar panels, thanks to its double-layer design. The new cell converts 22.4% of the incoming energy, a record in power conversion efficiency for a perovskite-CIGS tandem solar cell.

September 3, 2018. The Ministry of Education (MEXT) announced an [ambitious budget request that would allow Japan to compete](#) for the world's fastest supercomputer, build a replacement X-ray space observatory, and push ahead with a massive new particle detector. MEXT's proposal represents a 21% increase for its fiscal 2019 budget, to 1.17 trillion yen (\$10.54 billion).

September 4, 2018. A Japanese team is planning to [test a small prototype space elevator](#). Two ultra-small cubic satellites, developed by Shizuoka University Faculty of Engineering, will be connected by a 10 meter cable. This experiment will launch from Japan's Tanegashima Space Center.

September 5, 2018. Google's newest service, called [Dataset Search](#), will be a companion of sorts to Google Scholar, the company's popular search engine for academic studies and reports. Institutions that publish their data online, like universities and governments, will need to include metadata tags in their webpages that describe their data, including who created it, when it was published, how it was collected, and so on. This information will then be indexed by Dataset Search ([found here](#)) and combined with input from Google's Knowledge Graph.

September 10, 2018. Ten years ago, a beam of protons was shot for the first time around the entire 16.5-mile-long (27 kilometers) ring of the [Large Hadron Collider \(LHC\)](#) – the world's largest and highest energy atom smasher ever constructed. Since that day, the LHC program has published over 2,000 scientific papers.

September 12, 2018. A research group led by Assistant Professor Yosuke Ishii at Toyohashi University of Technology has unraveled the [phenomenon of a new "thick ultrasonic wave"](#) being generated when two ultrasonic waves intersect within a plate. This wave exhibits varying intensity in response to material damage and can therefore be used for nondestructively testing thin plate structures.

September 17, 2018. Researchers at The University of Tokyo Institute of Industrial Science have created a [model of the electrical and mechanical responses of crystal materials](#), based on the conflict between different lattice interactions. Creating a simple self-organization model based on spherical particles with a permanent dipole established the importance of the energetic frustration between the anisotropic steric and dipolar interactions in the self-organization process.

September 17, 2018. A team led by Professor Hiroaki Misawa Scientists at the Research Institute for Electronic Science at Hokkaido University has [developed a "golden sandwich" photoelectrode](#) that can harvest 85 percent of visible light. The invention sandwiched a 30-nanometer titanium dioxide thin-film semiconductor between a 100-nanometer gold film and gold nanoparticles to enhance light absorption. The gold film functioned as a mirror, trapping light in a cavity between the two gold layers.

September 17, 2018. Researchers at the University of Tokyo's Institute of Industrial Science in Japan developed a data-driven ["machine learning" approach to interpret much larger numbers of spectra](#). Applying the method to the interpretation of complex spectra from two core spectroscopy methods—energy-loss near-edge structure (ELNES) and X-ray absorption near-edge structure (XANES)—the researchers were able to obtain information about a material that cannot be determined manually and predict a spectrum from the material's geometric information alone.

September 18, 2018. Scientists at the [University of Tokyo have created a magnetic field](#) that is 50 million times stronger than the one surrounding Earth. This is a new world record for a magnetic field generated indoors and, because of the level of control this provides, has major implications for material sciences and the development of nuclear fusion.



Recent Scientific Papers of Interest

Papers for August 2018

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

Estimating the structure factors in X-ray diffraction. Fewster, Paul F. *Acta Crystallographica. Section A, Foundations & Advances.* Sep2018, Vol. 74 Issue 5, p481-498. 17p. DOI: [10.1107/S2053273318007593](#)

Quantitative mineralogy for facies definition in the Marcellus Shale (Appalachian Basin, USA) using XRD-XRF integration. Hupp, Brittany N.; Donovan, Joseph J. *Sedimentary Geology.* Sep2018, Vol. 371, p16-31. 16p. DOI: [10.1016/j.sedgeo.2018.04.007](#)

Unveiling the art of René Lalique with XRF and Raman spectroscopy – Technological innovation in jewellery production. Tissot, Isabel; Manso, Marta; Guerra, Maria Filomena. *Journal of Cultural Heritage.* Sep2018, Vol. 33, p83-89. 7p. DOI: [10.1016/j.culher.2018.03.014](#)

Structural testing of polyimide nanocomposite films with SAXS and SVM-PUK. Guo, Hai; Zhao, Jingying; Yin, Jinghua; Yao, Lei. *Polymer Testing.* Sep2018, Vol. 70, p30-38. 9p. DOI: [10.1016/j.polymer.2018.06.025](#)

Quantitative and structural analysis of minerals in soil clay fractions developed under different climate zones in China by XRD with Rietveld method, and its implications for pedogenesis. Zhao, Wei; Tan, Wen-Feng. *Applied Clay Science.* Sep2018, Vol. 162, p351-361. 11p. DOI: [10.1016/j.clay.2018.05.019](#)

The structural and dynamical role of water in natural organic matter: A ²H NMR and XRD study. Nanda, Raju; Reddy, U. Venkateswara; Bowers, Geoffrey M.; Bowden, Mark; Kirkpatrick, R. James. *Organic Geochemistry.* Sep2018, Vol. 123, p90-102. 13p. DOI: [10.1016/j.orggeochem.2018.06.011](#)

Determining the speciation of Zn in soils around the sediment ponds of chemical plants by XRD and XAFS spectroscopy and sequential extraction. Minkina, Tatiana; Nevidomskaya, Dina; Bauer, Tatiana; Shuvaeva, Victoria; Soldatov, Alexander; Mandzhieva, Svelava; Zubavichus, Yan; Trigub, Alexander. *Science of the Total Environment.* Sep2018, Vol. 634, p1165-1173. 9p. DOI: [10.1016/j.scitotenv.2018.04.118](#)

Identification of the role of Al-Fe-Mn-Si large casting dispersoids in age-hardenable aluminum alloys using small angle X-ray scattering. Saimoto, S.; Singh, M.A.; Langille, M.R.; Kula, A.; Niewczas, M. *Materials Science & Engineering: A.* Sep2018, Vol. 734, p51-58. 8p. DOI: [10.1016/j.msea.2018.07.085](#)

2018 atomic spectrometry update – a review of advances in X-ray fluorescence spectrometry and its special applications. VanHoof, Christine; Bacon, Jeffrey R.; Ellis, Andrew T.; Vincze, Laszlo; Wobrauschek, Peter. *JAAS (Journal of Analytical Atomic Spectrometry).* Sep2018, Vol. 33 Issue 9, p1413-1431. 19p. DOI: [10.1039/c8ja90030b](#)

Determination of minerals in infant milk formulae by energy dispersive X-ray fluorescence spectrometry. Papachristodoulou, C.; Tsiamou, M.-C.; Sakkas, H.; Papadopolou, C. *Journal of Food Composition & Analysis.* Sep2018, Vol. 72, p39-47. 9p. DOI: [10.1016/j.jfca.2018.06.007](#)

Graphene oxide covalently modified with 2,2'-iminodiacetic acid for preconcentration of Cr(III), Cu(II), Zn(II) and Pb(II) from water samples prior to their determination by energy dispersive X-ray fluorescence spectrometry. Zyblikowska, Katarzyna; Matusek, Marek; Hachula, Barbara; Pilch, Michał; Kornaus, Kamili; Puzko, Maciej; Pisarski, Wojciech A. *Spectrochimica Acta Part B.* Sep2018, Vol. 147, p79-86. 8p. DOI: [10.1016/j.sab.2018.05.023](#)

Evaluation of a simple preparation procedure for total-reflection X-ray fluorescence analysis of directly collected airborne particulate matter samples. Prost, J.; Zinkl, A.; Ingerle, D.; Wobrauschek, P.; Strelli, C. *Spectrochimica Acta Part B.* Sep2018, Vol. 147, p13-20. 8p. DOI: [10.1016/j.sab.2018.05.005](#)

Detecting trace levels of heavy metals in pharmaceutical raw materials with wavelength-dispersive X-ray fluorescence spectrometry and curve-fitting regression. Kikongi, Phillippe; Fauteux-Lefebvre, Clémence; Salvas, Joanny; Gosselet, Ryan. *Spectrochimica Acta Part B.* Sep2018, Vol. 147, p59-70. 12p. DOI: [10.1016/j.sab.2018.05.011](#)

Total reflection X-ray fluorescence medical applications: Elemental analysis of human urine. Majewska, U.; Lyzwa, P.; Kubala-Kukus, A.; Banas, D.; Wudarczyk-Mocko, J.; Stabrawa, I.; Gózdź, S. *Spectrochimica Acta Part B.* Sep2018, Vol. 147, p121-131. 11p. DOI: [10.1016/j.sab.2018.05.014](#)

Hydration dynamics in zeolite A – An X-ray diffraction and infrared spectroscopic study. Guo, Xin; Navrotsky, Alexandra. *Microporous & Mesoporous Materials.* Sep2018, Vol. 268, p197-201. 5p. DOI: [10.1016/j.micromeso.2018.04.040](#)

In-situ X-ray diffraction on functional thin films using a laboratory source during electrical biasing. Allouche, B.; Gueye, I.; Rhun, G. Le; Gergaud, P.; Vaxelaire, N. *Materials & Design.* Sep2018, Vol. 154, p340-346. 7p. DOI: [10.1016/j.matdes.2018.05.016](#)

Statistical effects in X-ray diffraction lattice strain measurements of ferritic steel using crystal plasticity. Erinosh, T.O.; Collins, D.M.; Todd, R.I.; Wilkinson, A.J.; Dunne, F.P.E. *Materials & Design.* Sep2018, Vol. 153, p159-165. 7p. DOI: [10.1016/j.matdes.2018.04.071](#)

Relative stability of hydrated/anhydrous products of calcium chloride during complete dehydration as examined by high-temperature X-ray powder diffraction. Karunadasa, Kohobhange S.P.; Manorathne, C.H.; Pitawala, H.M.T.G.A.; Rajapakse, R.M.G. *Journal of Physics & Chemistry of Solids.* Sep2018, Vol. 120, p167-172. 6p. DOI: [10.1016/j.jpcs.2018.04.034](#)

The real part of the dispersion surface in X-ray dynamical diffraction in the Laue case for perfect crystals. Saka, Takashi. *Acta Crystallographica. Section A, Foundations & Advances.* Sep2018, Vol. 74 Issue 5, p586-594. 8p. DOI: [10.1107/S2053273318009944](#)

Energy flow of Bloch waves in X-ray dynamical diffraction in the Laue case for perfect crystals. Saka, Takashi. *Acta Crystallographica. Section A, Foundations & Advances.* Sep2018, Vol. 74 Issue 5, p578-585. 7p. DOI: [10.1107/S2053273318009865](#)

Mineralogical evolution of ceramic clays during heating: An *in situ* X-ray diffraction method comparison study. Miras, Adolfo; Galán, Emilio; González, Isabel; Romero-Baena, Antonio; Martín, Domingo. *Applied Clay Science.* Sep2018, Vol. 161, p176-183. 8p. DOI: [10.1016/j.clay.2018.04.003](#)