Rigaku
Leading With Innovation

X-ray Diffraction & Elemental Analysis

Welcome

We want to thank everyone who visited Rigaku at the 30th Meeting of the European Cystallographic Association (ECM) at the Congress Center Basel, Switzerland during the last week of August. This conference featured 30 exhibitors and the usual plethora of almost 300 oral sessions, many workshops and too many posters to enumerate.

We wish to congratulate the winner of the Ninth Max Perutz Prize, Dr. Václav Petříček from the Institute of Physics of the Czech Academy of Sciences,who was recognized for his practical application of the theory of aperiodic structures in his computing system JANA. We also wish to congratulate the winner of the the Eighth Erwin Felix Lewy Bertaut Prize, Dr Linda Reinhard from the Karolinska Institutet @ DESY, who was recognized for her pioneering contributions to the crystallographic analysis of enzymes and the optimization of protein preparations for diffraction studies. Links to reports on this year's ECM, IGC and JASIS may be found be below.

Rigaku at the 2016 European Crystallographic Association (ECM)

Our featured Rigaku Journal articles this month cover the "Introduction to X-ray analysis using the diffraction method" and "Sample preparation for X-ray fluorescence analysis IV.
Fusion bead method—part 1 basic principals."

The video topic this month starts a new series exploring technologies of the future. This month we look at Japan's next generation MAGLEV rail transportation technology.

This month's featured XRD AppNote concerns "MiniFlex300/600 Monochromator features." Additional application notes include WDXRF, EDXRF and Raman technologies. Check out the book review, news and papers sections at the bottom of the page for the latest developments in materials science.

Enjoy the newsletter.

R.C. Tisdale, Ph.D. – Editor

Featured XRD Rigaku Journal Article

Introduction to X-ray analysis using the diffraction method

By Hideo Toraya, Rigaku Corporation

This article has been written for people who are beginning X-ray analysis of crystalline powder samples using the diffraction method. In X-ray powder diffraction measurements, a so-called X-ray diffraction pattern is recorded, in which many peaks, called diffraction lines, queue on the abscissa calibrating the diffraction angle. We often hear that it is much more difficult to understand what this diffraction pattern means when the pattern is compared, for examples, with infra-red spectra or the TG-DTA curve in thermal analysis. If we can understand how this diffraction pattern is generated when X-rays irradiate a crystal, it will become much easier to understand the relationship between the X-ray diffraction pattern and the crystal structural information. One purpose of this article is to elucidate the mechanism of X-ray diffraction by the crystal. **For full article >**

Featured XRF Rigaku Journal Article

Sample preparation for X-ray fluorescence analysis IV.
Fusion bead method—part 1 basic principals

By Mitsuru Watanabe, Rigaku Corporation

For the analysis of powders by XRF, sample inhomogeneity due to segregation, grain size and mineralogical effects influence X-ray intensity and can cause analysis errors. It is therefore recommended to analyze powder samples after fine pulverizing as described in "Sample Preparation for X-ray Fluorescence Analysis II. Pulverizing methods of powder samples." However, when inhomogeneity can not be sufficiently removed by pulverization and more accurate analysis is required, fusion bead method is advisable. **For full article >**

Japan Analytical Scientific Instrument Show (JASIS)

Report on JASIS 2016

Reported by Lani Celiz, Thermal Applications Scientist, Rigaku Corporation

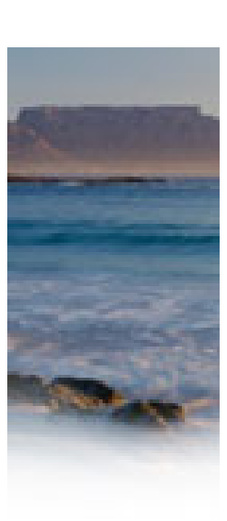
JASIS, one of the largest expositions in Asia for analytical and scientific instruments, was held September 7 – 9, 2016 in Makuhari Messe, Chiba, Japan. A total of 504 multinational and domestic companies, as well as various organizations, exhibited at this event, with more than 24,000 attendees.
For full report >

European Crystallography Meeting (ECM)

Report on ECM30

Reported by Alexandra Griffin, Global Product Manager for SCX, Rigaku Oxford Diffraction

ECM30 was held in Basel, Switzerland from August 28 – September 1, 2016. The conference was attended by around 900 people from various European countries and even some from farther afield. The weather was exceptional and we even had the opportunity to dine while watching the sunset. **For full report >**



International Geological Congress (IGC)

Report on IGC

Reported by Jenny Smith, Marketing Manager, Wirsam Scientific & Precision Equipment

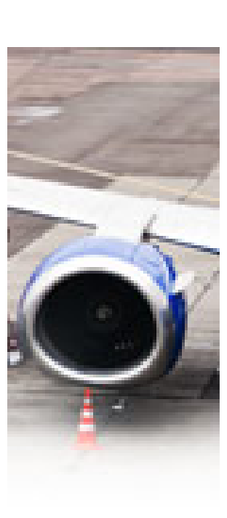
We want to thank everyone who visited Rigaku at IGC at the Cape Town International Convention Centre. The congress was attended by over 4,000 geologists from 120 countries, and the exhibition featured 117 exhibitors and the usual plethora of oral sessions, workshops and posters. **For full report >**

XRD Application Note

MiniFlex300/600 Monochromator features

Rigaku Corporation

Powder X-ray diffractometers are used in many fields of industry and research, for substances ranging from inorganic materials such as ceramics and minerals, to pharmaceuticals and other organic materials. The MiniFlex Series is a line of benchtop instruments – with 1/20 the volume, and 1/10 the weight, of stand-alone powder X-ray diffractometers – that can operate with power from an AC 100 V outlet. The current models in the MiniFlex Series include a high-power model type with a maximum rated output of 600 W (MiniFlex600), and a reduced-utility model, which requires no water facilities and only generates 300 W of output power (MiniFlex300). **For more >**

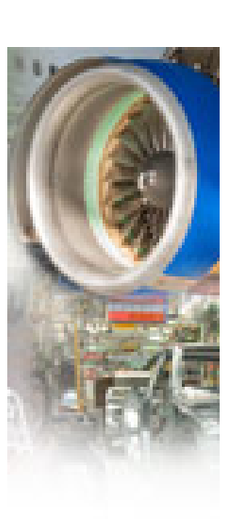


WDXRF Application Note

Fe, Ni and Co Alloy Analysis by Fundamental Parameter Method Using the Simultix14

Rigaku Corporation

The multi-channel X-ray fluorescence spectrometer "Simultix14" enables simultaneous measurements of all elements in samples and contributes to various kind of process control in production lines where extremely rapid analysis is required. Fe, Ni, Co alloys including high temperature alloy, tool steel, stainless steels, etc. have broad ranges of the concentrations for many elements and many of those alloys are analyzed in production control. **For more >**



EDXRF Application Notes

Titanium (Ti) on Aluminum and *Zirconium (Zr) on Aluminum*

Applied Rigaku Technologies

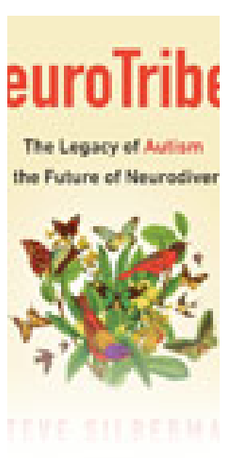
Aluminum and steel are often coated with a protective conversion coating, also called passivate or passivation coating, to prevent oxidation and corrosion of the base metal. Conversion coatings include Cr, Ti, V, Mn, Ni, or Zr. A phosphate coating may be applied as well to minimize wear on cutting tools 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. Protected steel is also used for outdoor sheds and other similar uses where steel is exposed to weathering. Conversion coating also help in the retention of paint for the final finished product.
For Titanium (Ti) on Aluminum Application Note >
For Zirconium (Zr) on Aluminum Application Note >

Raman Application Note

Sage Products: The RMID Challenge

Rigaku Analytical Devices

Sage Products LLC, a manufacturer and distributor of health and personal care products for the hospital and retail markets, was looking to improve the efficiency of its manufacturing process by reducing the time and costs associated with RMID analysis which was being carried out by internal and external laboratories. Having implemented a 1064nm handheld Raman instrument from Rigaku Analytical Devices, Sage has benefited from the ability to analyze a wider range of raw materials in their on-site receiving warehouse, which has led to a 90% reduction in the cost of analysis per sample, and more importantly a reduction in testing turn-around times to minutes rather than days. **For more >**



Scientific Book Reviews

NeuroTribes: The Legacy of Autism and the Future of Neurodiversity

My daughter Jeanette gave me this book when I last visited her in May, thinking I would enjoy it. She was right – *NeuroTribes* is fascinating. The author sets out to provide a comprehensive view of autism as we understand it today and does it well. Silberman begins with his introduction to the title subject through a Geek Cruise he sailed in 2000. The personalities of the hundred or so developers he interacted with on the cruise led him to research and write this book.
Read full review >

Dark Matter
I listened to an interview with the author, Blake Crouch, on Science Friday. Then, when I saw copies of the book all over the place, I picked one up for myself.
Read full review >

Material Analysis in the News

News for September 2016

September 1, 2016. Two scientists at the University of Central Florida have discovered how to get a solid material to act like a liquid without actually turning it into liquid, potentially opening a new world of possibilities for the electronic, optics and computing industries. Data was validated by X-ray diffraction.

September 1, 2016. Jose Andrade, professor of civil and mechanical engineering in the Division of Engineering and Applied Sciences at California Institute of Technology (Caltech) and his colleagues used a combination of computed tomography (CT) scanning and X-ray diffraction to measure the deformation of individual grains, in effect turning each particle into a force gauge that shows the direction and intensity of force.

September 1, 2016. Raman spectroscopy and X-ray diffraction measurements have worked together with first-principle calculations to examine the high-pressure structural behavior of magnesium chloride at a million atmospheres. Scientists from the Lawrence Livermore National Laboratory, Lawrence Berkeley National Laboratory and DESY Photon Science, Germany, and the University of Saskatchewan, Canada, have investigated the properties of beta-magnesium chloride under pressure, a compound used widely in the aviation industry as a de-icing agent

September 2, 2016. A research group in Japan has discovered the crystal structure of hydrogen sulfide (H_2S) in its superconducting phase at the relatively high temperature of -70°C. Led by Professor Katsuya Shimizu and Dr. Mari Einaga at the Graduate School of Engineering Science, Osaka University, together with colleagues at the Max Planck Institute for Chemistry in Germany and the Japan Synchrotron Radiation Research Institute, the researchers conducted simultaneous measurements of high pressure electrical resistance and X-ray diffraction at SPring-8 in Japan.

September 7, 2016. Viewpoint: Ghost imaging with X-rays. The technique of ghost imaging, which builds up images of objects by combining information from light collected at two detectors, has been demonstrated in the X-ray regime. Compared to conventional imaging, ghost imaging stands out in that it works with a weak (few photons) object beam if the reference beam is strong.

September 7, 2016. "Promising" and "remarkable" are two words U.S. Department of Energy's Ames Laboratory scientist Javier Vela uses to describe recent research results on organolead mixed-halide perovskites, which may lead to solar cell and LED advances.

September 16, 2016. With the help of the brilliant X-ray radiation from DESY's research light source PETRA III, scientists have solved a decades-old mystery from the world of art: A team led by Dr. Geert Van der Snickt of the University of Antwerp unravelled the nature of mysterious white spots on the famous painting "The Scream" by the Norwegian artist Edvard Munch.

September 20, 2016. X-ray diffraction by crystalline powders is one of the most powerful and most widely used methods for analyzing matter. It was discovered just 100 years ago, independently, by Paul Scherrer and Peter Debye in Göttingen, Germany; and by Albert Hull at the General Electric Laboratories, Schenectady, USA. – See more here.

September 21, 2016. Structural chemist and chemical crystallographer Dr. Alison Edwards has contributed to the characterisation of two large, complex silver nanoclusters of 136 and 374 atoms as part of an international collaboration led by researchers from Xiamen University in China.

September 21, 2016. According to a University press release, TEM-XRD is a University of New Mexico facility that works primarily in nanoscience, a field that studies extremely small structures and materials usually less than 100 nanometers in size, down to the atomic scale. There are currently six different instruments being used at the TEM-XRD facility, equipment that represents roughly $6 million.

September 21, 2016. Just as the hypothetical Schroedinger's Cat is alive and dead at the same time, molecules hit with a burst of laser light exist in two states at once – excited and unexcited. This weird quantum property allowed scientists at SLAC to make a molecular movie of excited iodine atoms in unprecedented detail.

September 23, 2016. Recently released X-ray diffraction measurements now claim to have confirmed the presence of multilayered silicene, and highlight the important role of growth temperatures to achieve the pure silicene phase. The 2D honeycomb lattice of silicon atoms was first reported in 1994 in a visionary theoretical paper by Kyozaburo Takeda and Kenji Shiraishi at NTT in Japan.

Recent Scientific Papers of Interest

Papers for September 2016

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

Chemical Species, Micromorphology, and XRD Fingerprint Analysis of Tibetan Medicine *Zuotai* Containing Mercury. Li, Cen; Yang, Hongxia; Du, Yuzhi; Xiao, Yuancan; Zhandui; Sanglao; Wang, Zhang; Ladan, Duojie; Bi, Hongtao; Wei, Lixin. *Bioinorganic Chemistry & Applications*. 9/21/2016, p1-11. 11p. DOI: 10.1155/2016/7010519.

Cation miscibility in KNO_3—$RbNO_3$ binary system. A combined SEM, EDX and XRD Rietveld analysis. Bouzazi, Khalil; Boughzala, Habib; Zamali, Hmida. *Journal of Alloys & Compounds*. Sep2016, Vol. 680, p512-521. 10p. DOI: 10.1016/j.jallcom.2016.04.050.

Raman and XRD studies on the influence of nano silicon surface modification on Li+ dynamics processes of $LiFePO_4$. Yang, Wenyu; Zou, Mingzhong; Zhao, Guiying; Hong, Zhensheng; Feng, Qian; Li, Jiaxin; Lin, Yingbin; Huang, Zhigao. *Solid State Ionics*. Sep2016, Vol. 292, p103-109. 7p. DOI: 10.1016/j.ssi.2016.05.017.

Characterisation of rust surfaces formed on mild steel exposed to marine atmospheres using XRD and SEM/Micro-Raman techniques. de la Fuente, D.; Alcántara, J.; Chico, B.; Díaz, I.; Jiménez, J.A.; Morcillo, M. *Corrosion Science*. Sep2016, Vol. 110, p253-264. 12p. DOI: 10.1016/j.corsci.2016.04.034.

Irradiation effects in 6H–SiC induced by neutron and heavy ions: Raman spectroscopy and high-resolution XRD analysis. Chen, Xiaofei; Zhou, Wei; Feng, Qijie; Zheng, Jian; Liu, Xiankun; Tang, Bin; Li, Jiangbo; Xue, Jianming; Peng, Shuming. *Journal of Nuclear Materials*. Sep2016, Vol. 478, p215-221. 7p. DOI: 10.1016/j.jnucmat.2016.06.020.

Growth and X-ray Diffraction Study and Specific Features of Thermal Expansion of $Ba_3NbFe_3Si_2O_{14}$ Single Crystal from the Langasite Family. Dudka, Alexander P.; Balbashov, Anatoly M.; Lyubutin, Igor S. *Crystal Growth & Design*. Sep2016, Vol. 16 Issue 9, p4943-4949. 7p. DOI: 10.1021/acs.cgd.6b00505.

Breaking the efficiency limit for high-frequency blazed multilayer soft x-ray gratings: Conical vs classical diffraction. Goray, L. I.; Egorov, A. Yu. *Applied Physics Letters*. 9/5/2016, Vol. 109 Issue 10, p103502-1-103502-4. 4p. 3 Graphs. DOI: 10.1063/1.4962395.

Phase transitions in secnidazole: Thermal stability and polymorphism studied by X-ray powder diffraction, thermal analysis and vibrational spectroscopy. Bezerra, Beatriz Pinheiro; Fonseca, Jéssica Castro; de Oliveira, Yara Santiago; de Santana, Maria Silmara A.; Silva, Keilla F.; Araújo, Bruno S.; Ayala, Alejandro Pedro. *Vibrational Spectroscopy*. Sep2016, Vol. 86, p90-96. 7p. DOI: 10.1016/j.vibspec.2016.06.007.

Combined X-ray absorption and X-ray diffraction under high pressure. Itié, Jean-Paul; Polian, Alain; Baudelet, François; Mocuta, Cristian; Thiaudière, Dominique; Fonda, Emiliano; Irifune, Tetsuo. *High Pressure Research*. Sep2016, Vol. 36 Issue 3, p479-492. 14p. DOI: 10.1080/08957959.2016.1206540.

X-ray powder diffraction reference patterns for Bi1–*x*Pb*x*OCuSe. Wong-Ng, W.; Yan, Y.; Kaduk, J.A.; Tang, X.F. *Powder Diffraction*. Sep2016, Vol. 31 Issue 3, p223-228. 6p. DOI: 10.1017/S0885715616000361.

Experimental estimation of uncertainties in powder diffraction intensities with a two-dimensional X-ray detector. Ida, Takashi. *Powder Diffraction*. Sep2016, Vol. 31 Issue 3, p216-222. 7p. DOI: 10.1017/S0885715616000324.

Assessment of marine and urban-industrial environments influence on built heritage sandstone using X-ray fluorescence spectroscopy and complementary techniques. Morillas, Héctor; García-Galan, Javier; Maguregui, Maite; Marcaida, Iker; García-Florentino, Cristina; Carrero, Jose Antonio; Madariaga, Juan Manuel. *Spectrochimica Acta Part B*. Sep2016, Vol. 123, p76-88. 13p. DOI: 10.1016/j.sab.2016.07.015.

An Energy-Dispersive X-Ray Fluorescence Spectrometry and Monte Carlo simulation study of Iron-Age Nuragic small bronzes ("*Navicelle*") from Sardinia, Italy. Schiavon, Nick; de Palmas, Anna; Bulla, Claudio; Piga, Giampaolo; Brunetti, Antonio. *Spectrochimica Acta Part B*. Sep2016, Vol. 123, p42-46. 5p. DOI: 10.1016/j.sab.2016.07.011.

Determination of Sulfide and Total Sulfur in Ore by Wavelength-Dispersive X-ray Fluorescence. Chubarov, Victor; Aisueva, Tatiana; Finkelshtein, Alexander. *Analytical Letters*. 2016, Vol. 49 Issue 13, p2099-2107. 9p. 3 Charts, 2 Graphs. DOI: 10.1080/00032719.2015.1136933.

Distinction between entrance and exit wounds by energy dispersive X-ray fluorescence spectrometry. Tanaka, Naoko; Kinoshita, Hiroshi; Takakura, Ayaka; Jamal, Mostofa; Ito, Asuka; Kumihashi, Mitsuru; Tsutsui, Kunihiko; Kimura, Shoji; Ameno, Kiyoshi. *Legal Medicine*. Sep2016, Vol. 22, p5-8. 4p. DOI: 10.1016/j.legalmed.2016.07.003.

Estimation of limits of detection and determination in X-ray fluorescence analysis by the dependence of the relative standard deviation on analyte concentration. Borkhodoev, V. *Journal of Analytical Chemistry*. Sep2016, Vol. 71 Issue 9, p872-877. 6p. DOI: 10.1134/S1061934816070054.

***In situ* X-ray diffraction characterization of NbS_2 nanosheets as the anode material for sodium ion batteries.** Ou, Xing; Xiong, Xunhui; Zheng, Fenghua; Yang, Chenghao; Lin, Zhihua; Hu, Renzong; Jin, Chao; Chen, Yu; Liu, Meilin. *Journal of Power Sources*. Sep2016, Vol. 325, p410-416. 7p. DOI: 10.1016/j.jpowsour.2016.06.055.

Pressure-induced phase transformation in *β*-eucryptite: An X-ray diffraction and density functional theory study. Chen, Yachao; Manna, Sukriti; Narayanan, Badri; Wang, Zhongwu; Reimanis, Ivar E.; Ciobanu, Cristian V. *Scripta Materialia*. Sep2016, Vol. 122, p64-67. 4p. DOI: 10.1016/j.scriptamat.2016.05.005.

Utilizing broadband X-rays in a Bragg coherent X-ray diffraction imaging experiment. Cha, Wonsuk; Liu, Wenjun; Harder, Ross; Xu, Ruqing; Fuoss, Paul H.; Hruszkewycz, Stephan O. *Journal of Synchrotron Radiation*. Sep2016, Vol. 23 Issue 5, p1241-1244. 3p. DOI: 10.1107/S1600577516010523.

Imaging nanoscale lattice variations by machine learning of x-ray diffraction microscopy data. Nouamane Laanait; Zhan Zhang; Christian M Schlepütz. *Nanotechnology*. 9/16/2016, Vol. 27 Issue 37, p1-1. 1p. DOI: 10.1088/0957-4484/27/37/374002.

Forensic classification of counterfeit banknote paper by X-ray fluorescence and multivariate statistical methods. Guo, Hongling; Yin, Baohua; Zhang, Jie; Quan, Yangke; Shi, Gaojun. *Forensic Science International*. Sep2016, Vol. 266, pe43-e47. 1p. DOI: 10.1016/j.forsciint.2016.06.008.

Forty-Nine Major and Trace Element Concentrations Measured in Soil Reference Materials NIST SRM 2586, 2587, 2709a, 2710a and 2711a Using ICP- MS and Wavelength Dispersive-XRF. Byers, Harris L.; McHenry, Lindsay J.; Grundl, Timothy J. *Geostandards & Geoanalytical Research*. Sep2016, Vol. 40 Issue 3, p433-445. 13p. DOI: 10.1111/j.1751-908X.2016.00376.x.

Validation and comparable analysis of aluminum in the popular Chinese fried bread youtiao by wavelength dispersive XRF. Hua, Hongying; Jiang, Xiaofei; Wu, Shimin. *Food Chemistry*. Sep2016, Vol. 207, p1-5. 5p. DOI: 10.1016/j.foodchem.2016.03.067.

The supramolecular structure of bone: X-ray scattering analysis and lateral structure modeling. Zhou, Hong-Wen; Burger, Christian; Wang, Hao; Hsiao, Benjamin S.; Chu, Benjamin; Graham, Lila. *Acta Crystallographica Section D: Structural Biology*. Sep2016, Vol. 72 Issue 9, p986-996. 10p. DOI: 10.1107/S2059798316011864.

Calibration of instrument and sample parameters for small angle X-ray scattering. Wei, Yanru; Li, Zhihong. *Instrumentation Science & Technology*. 2016, Vol. 44 Issue 5, p521-536. 16p. DOI: 10.1080/10739149.2016.1143838.

Comparison of AAS, EDXRF, ICP-MS and INAA performance for determination of selected heavy metals in HFO ashes. Mohammed, Hesham; Sadeek, Sadeek; Mahmoud, Abu Rehab; Zaky, Doaa. *Microchemical Journal*. Sep2016, Vol. 128, p1-6. 6p. DOI: 10.1016/j.microc.2016.04.002.

Nanoscaled In_2O_3:Sn films as material for thermoelectric conversion: achievements and limitations. Korotcenkov, G; Brinzari, V; Cho, B. *Bulletin of Materials Science*. Sep2016, Vol. 39 Issue 5, p1349-1354. 6p. DOI: 10.1007/s12034-016-1240-9.

Effect of nickel oxide substitution on bioactivity and mechanical properties of bioactive glass. Vyas, Vikash; Kumar, A; Singh, S; Pyare, Ram. *Bulletin of Materials Science*. Sep2016, Vol. 39 Issue 5, p1355-1361. 7p. DOI: 10.1007/s12034-016-1242-7.

Effects of Substitution on Solid-State Fluorescence in 9-Aryl-9-methyl-9*H*-9-silafluorenes. Yoshinori Yamanoi; Takayuki Nakashima; Masaki Shimada; Hiroaki Maeda; Hiroshi Nishihara. *Molecules*. Sep2016, Vol. 21 Issue 9, p1-10. 10p. DOI: 10.3390/molecules21091173.

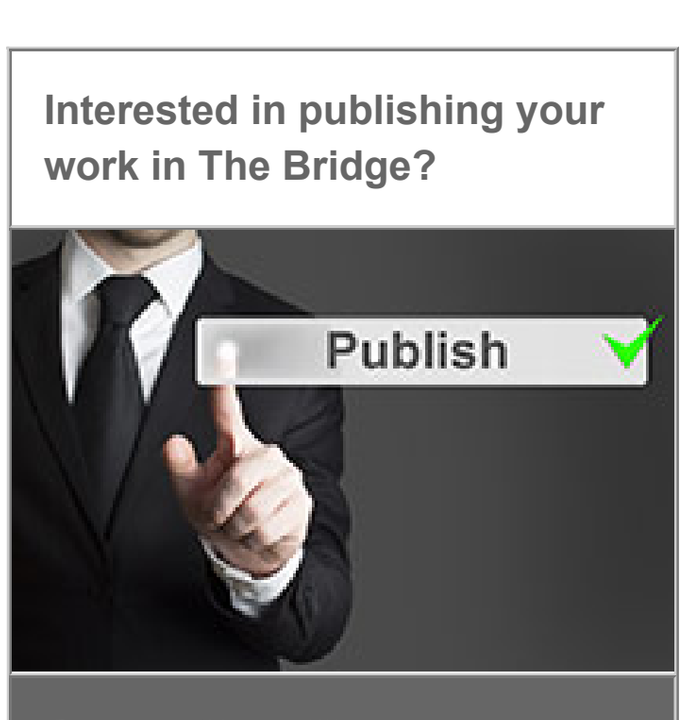
Growth and crystallographic characterization of molecular beam epitaxial WO_3 and MoO_3/WO_3 thin films on sapphire substrates. Yano, Mitsuaki; Koike, Kazuto; Matsuo, Masayuki; Murayama, Takayuki; Harada, Yoshiyuki; Inaba, Katsuhiko. *Applied Surface Science*. Sep2016, Vol. 381, p32-35. 4p. DOI: 10.1016/j.apsusc.2016.01.097.

Tube-above wavelength dispersive X-ray fluorescence spectrometer

ZSX Primus IV

As a tube-above sequential wavelength dispersive X-ray fluorescence spectrometer, the new Rigaku ZSX Primus IV delivers rapid quantitative determination of major and minor atomic elements, from beryllium (Be) through uranium (U), in a wide variety of sample types — with minimal standards.
For more >

Interested in publishing your work in The Bridge?



Publish Your Work Here

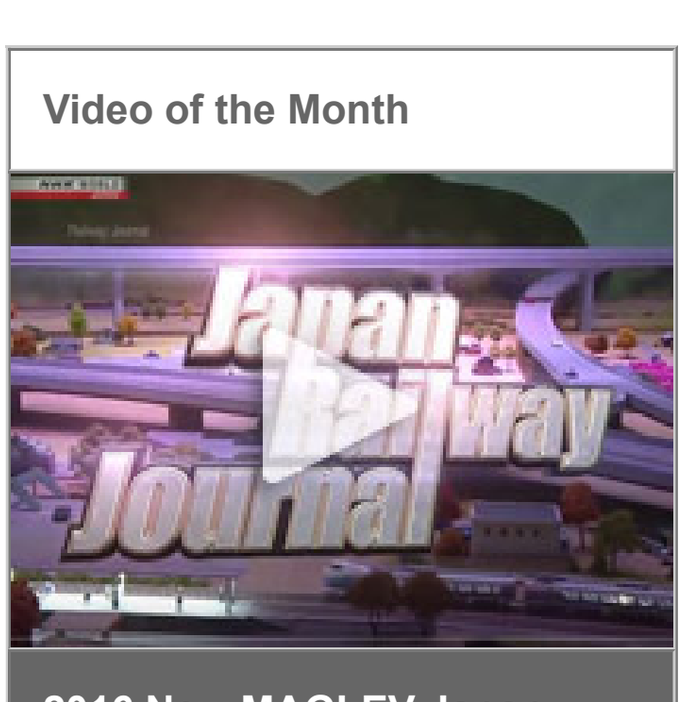
The Bridge now welcomes manuscripts, communications, and papers that describe techniques and applications of all forms of X-ray fluorescence (XRF) and X-ray diffraction (XRD, including SAXS) that are of interest to fellow scientists in industry, academia, and government. Manuscripts, in PDF format, are 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

MiniFlex – qualitative and quantitative analysis of polycrystalline materials

Benchtop X-ray diffraction (XRD) instrument

Ideally suited for today's fast-paced XRD analyses, the fifth generation MiniFlex delivers speed and sensitivity through innovative technology enhancements such as the optional D/teX high speed detector coupled with a 600 W X-ray source. Whether used for teaching X-ray diffraction at the college and university level, or routine industrial quality assurance, the MiniFlex delivers both performance and value.
For more >

Video of the Month



2016 New MAGLEV Japan Magnetic Levitation Train

Traveling at 500 km/h, the Superconducting Maglev will connect Tokyo to Nagoya in just 40 minutes and is planned to begin commercial service in 2027. To achieve such extreme speeds, magnetic levitation is used to lift the train 10 cm above the guideway. See the cutting-edge technology used to safely operate ultra-high speed services, and experience the world of 500 km/h rail travel in this report from the 42 km-long Yamanashi Maglev Test Line.
Watch video >

Conferences and Workshops

Join Rigaku at future meetings

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

Supply Side West
Las Vegas, NV, USA
October 4 – 8, 2016

CPhI Worldwide
Barcelona, Spain
October 4 – 6, 2016

Analytica China
Shanghai, China
October 10 – 12, 2016

Gulf Coast Conference (GCC)
Houston, TX, USA
October 11 & 12, 2016

See the complete list >

Useful link of the Month

Wolfram Alpha

Wolfram Alpha is a computational knowledge engine developed by Wolfram Research, which was founded by Stephen Wolfram. It is an online service that answers factual queries directly by computing the answer from externally sourced "curated data", rather than providing a list of documents or web pages that might contain the answer as a search engine might. Wolfram Alpha, which was released on May 18, 2009, is based on Wolfram's earlier flagship product Mathematica, a computational platform or toolkit that encompasses computer algebra, symbolic and numerical computation, visualization, and statistics capabilities. **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 configura-tion 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 life sciences. **Join us >**

Like Tweet SHARE