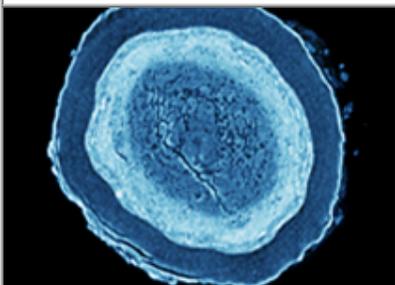


Upcoming Webinar



X-ray Computed Tomography for Materials Science

Join us on September 25th for the third webinar on X-ray Computed Tomography for Materials Science. Learn about X-ray CT applications in the food and pharmaceutical industries such as analysis of sugar coatings, seed structures, food texture, and cracks and aggregations in tablets. Find out how to achieve high contrast in low density food and pharmaceutical samples.

For more information >

Non-destructive measurement of particle size and size distribution



NANOPIX mini

Welcome

On July 15, 2019 Rigaku Corporation announced the closing of the acquisition process for XwinSys Technology Development Ltd, headquartered in Migdal Haemek, Israel. In a [press release](#) issued earlier this month, Rigaku President and CEO Hikaru Shimura said, “The acquisition of XwinSys Technologies Development Ltd., with its unique hybrid technology, represents a significant step in the expansion of our semiconductor division.”

August is vacation time for many people, so events are noticeably fewer. Nevertheless, there are several of importance, including: Microscopy & Microanalysis (Portland, Booth 437), Denver X-ray Conference (Lombard, IL), European Crystallographic Meeting (Vienna, Booth D09) and ACS Fall (San Diego, Booth 1627). A complete list of all upcoming events can be found [here](#).

Reflecting on the 50th anniversary of the Apollo 11 moon landing, I regret that I did not get to see it live ... as television had not yet come to West Texas. However, I vividly recall listening to the “first steps” at 9:30PM Houston time via Voice of America on shortwave radio. In celebration of this monumental scientific and engineering achievement, check out the video and useful link below. This link to a [realtime recreation of the mission](#) may be the most impressive web site that I have encountered.

The featured trip report this month discusses the 18th International Conference on Total Reflection X-ray Fluorescence Analysis and Related Methods (TXRF2019) and Workshop. This month's featured article covers a common materials database for multiple application plugins. As usual, please find links to new and interesting XRD, WDXRF and EDXRF AppNotes below.

The book review covers *The Lives of Bees: The Untold Story of the Honey Bee in the Wild* by Thomas D. Seeley. 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 Report

18th International Conference on Total Reflection X-ray Fluorescence Analysis and Related Methods (TXRF2019) and Workshop

Reported by Hikari Takahara, Application Scientist and Satoshi Ikeda, SBU Manager of EDX products at Rigaku Corporation



Total Reflection X-ray Fluorescence (TXRF) spectrometry is a surface analysis method using the X-ray grazing incident angle. This technique has been accepted for ultra-trace elemental analysis on silicon wafers in the semiconductor industry for a couple of decades and has recently seen use for environmental water, food, and biological analysis in numerous fields. The International Conference on TXRF has

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?

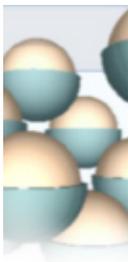


Publish Your Work Here

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 [email copy](#) to the editor.

An upgradeable single crystal X-ray diffractometer for structural analysis of small molecule samples

been held every two years since 1986, and the 18th conference took place on June 25–28 in Girona, Spain. **For more >**

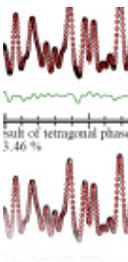


Featured Article

[Common Materials Database for Multiple Application Plugins](#)

Article by Akito Sasaki, Rigaku Corporation

There are only a few applications for analyzing unknown materials using X-ray diffraction, reflectivity, or small-angle scattering techniques. In most cases, previous information about the materials included in a sample is required, and the analysis of the structures of the materials is based on this information. **For more >**



XRD Application Note

[Structure determination of ferroelectric nano-powder by PDF analysis](#)

Rigaku Corporation

Ferroelectric BaTiO₃ (BT) is widely used as a capacitor material. The ferroelectricity of BT is strongly related to its tetragonal crystal structure, but when the particle size becomes less than several tens of nanometers, the structure exhibits cubic symmetry and the ferroelectricity disappears. A structural model where the central core is tetragonal and the outer shell is made of a cubic crystal has been proposed for BT. **For more >**

WDXRF Application Note

[Boron and Fluorine in Water Solution by Micro-Droplet Method Using “Ultra Carry” Filter Paper](#)

Rigaku Corporation

When elements in a liquid are analyzed by XRF spectrometry, the direct liquid analysis method, where a liquid sample is poured into a liquid cell with sample film and measured under helium, is usually used. However, the wavelengths of the element lines of boron (B-Kα) and fluorine (F-Kα) are so long that they are absorbed by the sample film. This means that boron and fluorine in water cannot be analyzed by the direct liquid analysis method by XRF. **For more >**



EDXRF Application Note

[Chromium on HDG 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. The measurement of chromium (Cr) conversion coating on hot-dip galvanized steel is demonstrated. **For more >**

Book Review

[The Lives of Bees: The Untold Story of the Honey Bee in the Wild](#)

By Thomas D. Seeley

Thomas D. Seeley's *The Lives of Bees* is the culmination of over four decades of formal research and nearly a lifetime's worth of personal interest in honey bees. Indeed, *The Lives of Bees* feels more like an incredibly thoughtful, well-written, and meticulously researched doctoral dissertation than a work of popular science—but



XtaLAB Synergy-i

The XtaLAB Synergy-i single crystal X-ray diffractometer includes a high-flux, low-maintenance microfocus sealed tube source, a high-precision 4-circle kappa goniometer and one of Rigaku's own Hybrid Photon Counting (HPC) X-ray detectors, the HyPix Bantam. Containing the latest microfocus source technology the XtaLAB Synergy-i can be upgraded to dual source (Cu/Mo) to address a wider range of research interests. For ease of use and high performance, the system is controlled by the fully-integrated, user-inspired CrysAlis^{Pro} software package, which is capable of collecting and processing data efficiently and accurately, so you achieve the best data possible.

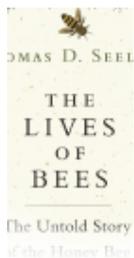
For more >

Video of the Month

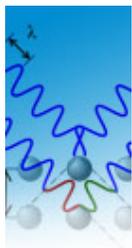


APOLLO 11 Official Trailer

Apollo 11 is a 2019 American documentary film edited, produced and directed by Todd Douglas Miller. It focuses on the 1969 Apollo



not in a bad way. What distinguishes *The Lives of Bees* from other works in the genre—as Seeley himself declares early on—is that it concerns itself not with domesticated honey bees but with wild ones. **Read review >**



Material Analysis in the News

News for July 2019

July 1, 2019. Researchers at the Center for Quantum Nanoscience (QNS) within the Institute for Basic Science (IBS) at Ewha Womans University have made a major scientific breakthrough by performing the [world's smallest magnetic resonance imaging](#) (MRI).

July 1, 2019. Citizen scientists have discovered that [solar storms become more complex as the Sun's 11-year activity cycle reaches its maximum](#) — a finding that could help forecasters predict which space weather events could have potentially devastating consequences for modern technologies at Earth.

July 2, 2019. By energizing precursor molecules using a tiny, high-energy supersonic jet of inert gas, researchers have [dramatically accelerated the fabrication of nanometer scale structures](#). The rapid additive manufacturing technique also allows them to produce structures with high aspect ratios.

July 4, 2019. Researchers at the Harvard John A. Paulson School of Engineering and Applied Sciences (SEAS) have developed a highly compact, [portable camera that can image polarization](#) in a single shot. The miniature camera — about the size of a thumb — could find a place in the vision systems of autonomous vehicles, onboard planes or satellites to study atmospheric chemistry, or be used to detect camouflaged objects.

July 4, 2019. Scientists in Oak Ridge National Laboratory in eastern Tennessee have completed building equipment they are to test this summer that [may allow us the first glimpse of a parallel universe](#) that could be identical in many ways to our own, with mirror particles, mirror planets and possibly even mirror life.

July 8, 2019. A team of scientists at [Imperial College London has developed a new type of organic light emitting diode \(OLED\)](#) that avoids the shortcoming of having 50% of the light emitted absorbed by the anti-glare filter. The research, published in the journal *ACS Nano*, shows that by controlling the chemistry of the OLED materials it is possible to produce OLEDs that give off a special type of polarised light, which can bypass the anti-glare filter.

July 11, 2019. Japan's [Hayabusa2 successfully completed its second touchdown on the asteroid](#) Ryugu and probably captured material from its interior that was exposed by firing a projectile into the asteroid earlier this year. It is the first collection of subsurface materials from a solar system body other than the moon.

July 11, 2019. Cells equipped with superparamagnetic iron oxide nanoparticles (SPIOs) can be directed to a specific location by an external magnetic field, which is beneficial for tissue repair. Naosuke Kamei, MD, PhD, Hiroshima University, Hiroshima, Japan, and colleagues [demonstrated the safety of magnetically labeled mesenchymal stem cells](#) (MSCs) based on karyotyping, colony formation assays,

11 mission, the first spaceflight from which men walked on the Moon. The film consists solely of archival footage, including 70 mm film previously unreleased to the public, and does not feature narration, interviews or modern recreations. The Saturn V rocket, Apollo crew consisting of Buzz Aldrin, Neil Armstrong, and Michael Collins, and Apollo program Earth-based support staff are prominently featured in the film. The film premiered at the Sundance Film Festival on January 24, 2019.

For more >

Conferences and Workshops



Join Rigaku at future meetings

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

Microscopy & Microanalysis (M&M) 2019

Portland, OR
August 4 – 8, 2019

Denver X-ray Conference

Lombard, IL
August 5 – 9, 2019

Taipei Aerospace & Defense Technology Expo

Taipei, Taiwan
August 15– 17, 2019

European Crystallographic Meeting

Vienna, Austria
August 18 – 23, 2019

See the complete list >

and total proliferation.

July 17, 2019. A [multitasking graphene device](#), developed by researchers at the U.S. Department of Energy's Lawrence Berkeley National Laboratory (Berkeley Lab), easily switches from a superconductor that conducts electricity without losing any energy, to an insulator that resists the flow of electric current, and back again to a superconductor – all with a simple flip of a switch.

July 18, 2019. [Heat transfer through a single molecule](#) has been measured for the first time by an international team of researchers led by the University of Michigan. This could be a step toward molecular computing — building circuits up from molecules rather than carving them out of silicon as a way to max out Moore's Law and make the most powerful conventional computers possible.

July 19, 2019. [June 2019 was the hottest in 140 years, setting a global record](#), according to the latest monthly global climate report released by the U.S. National Oceanic and Atmospheric Administration.

July 19, 2019. A joint research group including Ryo Yoshida (Professor and Director of the Data Science Center for Creative Design and Manufacturing at the Institute of Statistical Mathematics [ISM], Research Organization of Information and Systems), Junko Morikawa (Professor at the School of Materials and Chemical Technology, Tokyo Institute of Technology [Tokyo Tech]), and Yibin Xu (Group Leader of Thermal Management and Thermoelectric Materials Group, Center for Materials Research by Information Integration, Research and Services Division of Materials Data and Integrated System [MaDIS], NIMS) has [demonstrated the promising application of machine learning](#) (ML) — a form of AI that enables computers to "learn" from given data — for discovering innovative materials.

July 21, 2019. Fireworks lit up the sky as part of a live interactive countdown to the anniversary of Neil Armstrong's first steps on the moon 50 years earlier at the [Apollo 11 50th anniversary celebration](#) at Space Center Houston on July 20, 2019, in Houston, Texas. An estimated 500 million people watched the historic Apollo 11 moon landing, the largest television audience for a live broadcast at that time.

July 25, 2019. Japan's Sumitomo Rubber engineers have developed a [tire design that would leverage friction to produce electricity](#) for a vehicle's onboard accessories. The energy-harvesting tire concept was dreamt up together with researchers from Japan's Kansai University, with the system consisting of a regular car tire and a special energy harvesting device planted inside it.

July 26, 2019. Observations of light coming from a star zipping in orbit around the humongous black hole at the center of our galaxy have provided [fresh evidence backing Albert Einstein's 1915 theory of general relativity](#), astronomers said on Thursday. Researchers studied a star called S0-2, boasting a mass roughly 10 times larger than the sun, as it travels in an elliptical orbit lasting 16 years around the supermassive black hole called Sagittarius A*.

Recent Scientific Papers of Interest

Papers for July 2019

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



Useful Link of the Month



APOLLO 11 in Real Time

This website replays the Apollo 11 mission as it happened, 50 years ago. It consists entirely of historical material, all timed to Ground Elapsed Time—the master mission clock. Footage of Mission Control, film shot by the astronauts, and television broadcasts transmitted from space and the surface of the Moon, have been painstakingly placed to the very moments they were shot during the mission, as has every photograph taken, and every word spoken. **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

Theoretical study of the properties of X-ray diffraction moiré fringes. II. Illustration of angularly integrated moiré images. Yoshimura, Jun-ichi. *Acta Crystallographica. Section A, Foundations & Advances*. Jul2019, Vol. 75 Issue 4, p610-623. 14p. DOI: [10.1107/S2053273319004601](https://doi.org/10.1107/S2053273319004601).

Multipole electron densities and atomic displacement parameters in urea from accurate powder X-ray diffraction. Svane, Bjarke; Tolborg, Kasper; Jørgensen, Lasse Rabøl; Roelsgaard, Martin; Jørgensen, Mads Ry Vogel; Brummerstedt Iversen, Bo. *Acta Crystallographica. Section A, Foundations & Advances*. Jul2019, Vol. 75 Issue 4, p600-609. 10p. DOI: [10.1107/S205327331900799X](https://doi.org/10.1107/S205327331900799X).

High-pressure study of a nanostructured SnSe_{1-x}S_x (x=0.5) solid solution by *in-situ* X-ray diffraction and *ab-initio* calculations. da Silva Marques, Larissa; de Oliveira Ferreira, Joelma Maria; Rebelo, Querem Hapuque Félix; Ghosh, Angsula; Trichês, Daniela Menegon; de Souza, Sérgio Michielon. *Journal of Alloys & Compounds*. Jul2019, Vol. 792, p536-542. 7p. DOI: [10.1016/j.jallcom.2019.04.043](https://doi.org/10.1016/j.jallcom.2019.04.043).

X-ray diffraction and stress relaxations to study thermal and stress-assisted annealings in nanocrystalline gold thin films. Godard, P.; Faurie, D.; Sadat, T.; Drouet, M.; Thiaudière, D.; Renault, P.O. *Acta Materialia*. Jul2019, Vol. 173, p87-95. 9p. DOI: [10.1016/j.actamat.2019.04.024](https://doi.org/10.1016/j.actamat.2019.04.024).

High-temperature X-ray diffraction, Raman and IR spectroscopy on serandite. Ye, Yu; Li, Long; Smyth, Joseph R.; Wang, Zhongping; Liu, Dan; Wang, Xiang; Wang, Cao. *Physics & Chemistry of Minerals*. Jul2019, Vol. 46 Issue 7, p705-715. 11p. DOI: [10.1007/s00269-019-01032-2](https://doi.org/10.1007/s00269-019-01032-2).

Elemental analysis and imaging of sunscreen fingermarks by X-ray fluorescence. Zheng, Ling-Na; Ma, Rong-Liang; Li, Qian; Sang, Yuan-Bo; Wang, Hai-Long; Wang, Bing; Yan, Qi-Qi; Chen, Dong-Liang; Wang, Meng; Feng, Wei-Yue; Zhao, Yu-Liang. *Analytical & Bioanalytical Chemistry*. Jul2019, Vol. 411 Issue 18, p4151-4157. 7p. DOI: [10.1007/s00216-019-01718-0](https://doi.org/10.1007/s00216-019-01718-0).

Rapid direct determination of tin in beverages using energy dispersive X-ray fluorescence. Lerner, Nadav; Sedgi, Itzhak; Chernia, Zelig; Zeiri, Offer. *Talanta*. Jul2019, Vol. 199, p662-666. 5p. DOI: [10.1016/j.talanta.2019.03.024](https://doi.org/10.1016/j.talanta.2019.03.024).

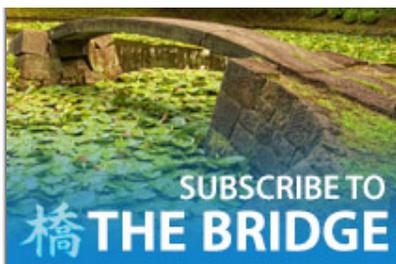
Characterisation of dairy processing sludge using energy dispersive X-ray fluorescence spectroscopy. Daly, Karen; Fenton, Owen; Ashekuzzaman, S.M.; Fenelon, Anna. *Process Safety & Environmental Protection: Transactions of the Institution of Chemical Engineers Part B*. Jul2019, Vol. 127, p206-210. 5p. DOI: [10.1016/j.psep.2019.05.026](https://doi.org/10.1016/j.psep.2019.05.026).

Feasibility study of a new method to measure fast neutron flux by neutron-induced X-ray fluorescence method. Qing, Shan; Hongkui, Zhu; Zhiling, Kong; Wenbao, Jia; Daqian, Hei; Yongsheng, Ling. *Applied Radiation & Isotopes*. Jul2019, Vol. 149, p60-64. 5p. DOI: [10.1016/j.apradiso.2019.04.022](https://doi.org/10.1016/j.apradiso.2019.04.022).

Herbarium X-ray fluorescence screening for nickel, cobalt and manganese hyperaccumulator plants in the flora of Sabah (Malaysia, Borneo Island). van der Ent, Antony; Ocenar, Ana; Tisserand, Romane; Sugau, John B.; Echevarria, Guillaume; Erskine, Peter D. *Journal for Geochemical Exploration*. Jul2019, Vol. 202, p49-58. 10p. DOI: [10.1016/j.gexplo.2019.03.013](https://doi.org/10.1016/j.gexplo.2019.03.013).

Elemental characterization of nuclear materials using total reflection X-ray fluorescence spectrometry. Dhara, Sangita; Misra, N.L. *Trends in Analytical Chemistry: TRAC*. Jul2019, Vol. 116, p31-43. 13p. DOI: [10.1016/j.trac.2019.04.017](https://doi.org/10.1016/j.trac.2019.04.017).

Full-field XRF instrument for cultural heritage: Application to the study of a Caillebotte painting. Walter, Philippe; Sarrazin, Philippe; Gailhanou, Marc; Hérouard, Dominique; Verney,



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 >**

Antoine; Blake, David. *XRS: X-ray Spectrometry*. Jul/Aug2019, Vol. 48 Issue 4, p274-281. 8p. DOI: [10.1002/xrs.2841](https://doi.org/10.1002/xrs.2841).

Reversible rearrangement of magnetic nanoparticles in solution studied using time-resolved SAXS method. Huang, Lanqing; Mai, Jingeng; Zhu, Qihui; Guo, Zhen; Qin, Siying; Yang, Peilin; Li, Xuanxuan; Shi, Yingchen; Wang, Xiaotian; Wang, Qining; Li, Na; Xie, Can; Liu, Haiguang. *Journal of Synchrotron Radiation*. Jul2019, Vol. 26 Issue 4, p1294-1301. 8p. DOI: [10.1107/S1600577519004909](https://doi.org/10.1107/S1600577519004909).

The PONKCS method applied for time resolved XRD quantification of supplementary cementitious material reactivity in hydrating mixtures with ordinary Portland cement. Naber, C.; Stegmeyer, S.; Jansen, D.; Goetz-Neunhoeffler, F.; Neubauer, J. *Construction & Building Materials*. Jul2019, Vol. 214, p449-457. 9p. DOI: [10.1016/j.conbuildmat.2019.04.157](https://doi.org/10.1016/j.conbuildmat.2019.04.157).

Breslow Intermediates from a Thiazolin-2-ylidene and Fluorinated Aldehydes: XRD and Solution-Phase NMR Spectroscopic Characterization. Paul, Mathias; Neudörfel, Jörg-M.; Berkessel, Albrecht. *Angewandte Chemie*. 7/29/2019, Vol. 131 Issue 31, p10706-10710. 5p. DOI: [10.1002/ange.201904308](https://doi.org/10.1002/ange.201904308).

EBSD, XRD and SRS characterization of a casting Al-7wt%Si alloy processed by equal channel angular extrusion: Dislocation density evaluation. Zribi, Zahra; Ktari, Hassan Houcin; Herbst, Frédéric; Optasanu, Virgil; Njah, Nabil. *Materials Characterization*. Jul2019, Vol. 153, p190-198. 9p. DOI: [10.1016/j.matchar.2019.04.044](https://doi.org/10.1016/j.matchar.2019.04.044).

Argon ions deeply implanted in silicon studied by Rutherford/Elastic Backscattering and Grazing Incidence X-ray Fluorescence spectroscopy. Kokkoris, M.; Androulakaki, E.G.; Czyzycki, M.; Erich, M.; Karydas, A.G.; Leani, J.J.; Migliori, A.; Ntemou, E.; Paneta, V.; Petrovic, S. *Nuclear Instruments & Methods in Physics Research Section B*. Jul2019, Vol. 450, p144-148. 5p. DOI: [10.1016/j.nimb.2018.08.048](https://doi.org/10.1016/j.nimb.2018.08.048).

X-ray diffraction study on the orientation dynamics of biaxial microcrystals under static and rotating magnetic fields. Kimura, F.; Horii, S.; Arimoto, I.; Notsu, D.; Doi, T.; Wada, M.; Kimura, T. *CrystEngComm*. 7/28/2019, Vol. 21 Issue 28, p4221-4226. 6p. DOI: [10.1039/c9ce00599d](https://doi.org/10.1039/c9ce00599d).

Single Laser Shot Photoinduced Phase Transition of Rubidium Manganese Hexacyanoferrate Investigated by X-ray Diffraction. Azzolina, Giovanni; Collet, Eric; Mariette, Céline; Cammarata, Marco; Trzop, Elzbieta; Sander, Mathias; Levantino, Matteo; Nakagawa, Kosuke; Tokoro, Hiroko; Ohkoshi, Shin-ichi; Bertoni, Roman. *European Journal of Inorganic Chemistry*. 7/23/2019, Vol. 2019 Issue 27, p3142-3147. 6p. DOI: [10.1002/ejic.201801478](https://doi.org/10.1002/ejic.201801478).

Raman and single-crystal X-ray diffraction evidence of pressure-induced phase transitions in a perovskite-like framework of [(C₃H₇)₄N] [Mn(N(CN)₂)₃]. Maczka, Mirosław; Collings, Ines E.; Leite, Fabio Furtado; Paraguassu, Waldecy. *Dalton Transactions: An International Journal of Inorganic Chemistry*. 7/7/2019, Vol. 48 Issue 25, p9072-9078. 7p. DOI: [10.1039/c9dt01648a](https://doi.org/10.1039/c9dt01648a).

X-ray diffraction on aged Brazilian wood species. Almeida, Tiago Hendrigo de; Sardela, Mauro; Lahr, Francisco Antonio Rocco. *Materials Science & Engineering: B*. Jul2019, Vol. 246, p96-103. 8p. DOI: [10.1016/j.mseb.2019.05.028](https://doi.org/10.1016/j.mseb.2019.05.028).

The Correction of the Line Profiles for X-Ray Diffraction Peaks by Using Three Analysis Methods. Chellab, Rasha Munir; Harbbi, Khalid Hellal. *AIP Conference Proceedings*. 7/17/2019, Vol. 2123 Issue 1, p020044-1-020044-8. 8p. DOI: [10.1063/1.5116971](https://doi.org/10.1063/1.5116971).

Quantum chemical methods in charge density studies from X-ray diffraction data. Korlyukov, A. A.; Nelyubina, Yu V. *Russian Chemical Reviews*. 7/31/2019, Vol. 88 Issue 7, p1-1. 1p. DOI: [10.1070/RCR4866](https://doi.org/10.1070/RCR4866).

Lab-Scale *In Situ* X-Ray Diffraction Technique for Different Battery Systems: Designs, Applications, and Perspectives. Xia, Maoting; Liu, Tingting; Peng, Na; Zheng, Runtian; Cheng, Xing; Zhu, Haojie; Yu, Haoxiang; Shui, Miao; Shu, Jie. *Small Methods*. 7/10/2019, Vol. 3 Issue 7, pN.PAG-N.PAG. 1p. DOI: [10.1002/smtd.201900119](https://doi.org/10.1002/smtd.201900119).

Copyright © 2019 – Rigaku Corporation and its Global Subsidiaries. All Rights Reserved.

