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Welcome

2020 will be a busy year for Rigaku with [many events](#) already scheduled across the globe.

The new year also brings a new look to The Bridge! The new design is optimized for easy mobile and tablet viewing.



Scenic images of Rigaku Yamanashi factory and the surrounding area

This month's Rigaku Journal article discusses the basic principle and operation methods of the direct-derivation method. Featured in this issue is a report on last month's Conference of the Asian Crystallographic Association ([AsCA 2019](#)), at which Rigaku presented an informative workshop on the latest techniques in single crystal and powder diffraction.

This month's issue also contains application notes for XRD, XRF, and EDXRF. The XRD application note discusses the crystallization of chocolate obtained under several tempering speeds observed by simultaneous XRD-DSC measurement. In the XRF Application Note, Rigaku introduces the GEO-TRACE-PAK and demonstrates analysis results of trace elements in geological samples using this analysis package. The EDXRF application note covers the analysis of air filters and compliance with instrument sensitivity as outlined by U.S. EPA method IO-3.3.

A collection of news reports presenting the latest developments in materials science is also included at the bottom of the page.

Enjoy!

Upcoming Rigaku Events

Thin Film XRD Forum

Neu-Isenburg, Germany

February 10-13, 2020

ISRI Mid-America Chapter

St. Louis, MO

February 12-13, 2020

General Police Equipment Exhibition & Conference (GPEC) 2020

Booth B105

Frankfurt, Germany

February 18 -20, 2020

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Featured Journals & Reports



Basic principle and operation methods of the direct-derivation method

By Hideo Toraya, Rigaku Corporation

Quantitative phase analysis (QPA) using the X-ray diffraction technique is routinely employed to find weight ratios of individual component phases in a mixture. Techniques for QPA have been widely used not only in research and development but also routinely deployed for quality control of industrial products. Various techniques have been proposed for QPA in past decades.

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Asian Crystallographic Association Conference

Reported by Joseph D. Ferrara, Ph.D., Rigaku Americas Corporation

In mid-December, several of us attended the 16th Conference of the Asian Crystallographic Association held at UTown at the National University of Singapore. The conference focused on three main topics: macromolecular crystallography, chemical crystallography, and materials and applications, with parallel sessions for each. Over 450 scientists attended the conference.

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Featured Products



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.

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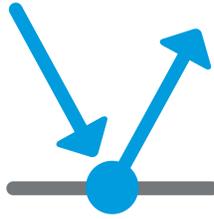
ZSX Primus IV

As a tube-above sequential wavelength dispersive X-ray fluorescence (WDXRF) spectrometer, the 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.

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Featured Application Notes

XRD



Crystallization of chocolate observed by simultaneous XRD-DSC measurement

Rigaku Corporation

Chocolate gets its mild taste, flavor, and meltable texture through tempering. The tempering process deliberately changes the crystallization temperature, thereby controlling the crystal phase efficiently. Here we study the crystal structure and crystallization temperature of chocolate obtained under several tempering speeds by simultaneous XRD-DSC measurement.

[Read More](#)

XRF



Trace Element Analysis in Geological Samples by Pressed Powder Method

Rigaku Corporation

Trace elements in geological materials, such as rock, sediment, mineral and ore, are important from the stand-point of natural resource and the environment. To establish calibration for trace elements in such a broad range of geological materials, it is necessary to collect many reference materials covering a wide variety of compositions.

[Read More](#)

EDXRF



Analysis of Air Filters | U.S. EPA Sensitivity

Applied Rigaku Technologies

The analysis of air filters and compliance with instrument sensitivity as outlined by U.S. EPA method IO-3.3 is demonstrated using Rigaku EDXRF indirect excitation with secondary targets and polarization in full Cartesian geometry.

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Featured Video & Useful Link of the Month



A new method of 3D printing is a breakthrough for manufacturing

Researchers at Harvard's Wyss Institute for Biologically Inspired Engineering and John A. Paulson School of Engineering and Applied Sciences (SEAS) developed a new method known as multimaterial multinozzle 3D printing or MM3D. MM3D achieves fast and continuous switching among up to eight different printing materials.



Materials Algorithms Project (MAP)

MAP provides algorithms for use in the modelling of materials. It features general information about MAP, a library of downloadable programs, subroutines, and functions for the modelling of materials. MAP owes its origins to the National Physical Laboratory and the Phase Transformations Group of the University of Cambridge. It is a non-profit venture, sponsored originally by the Engineering and Physical Sciences Research Council (EPSRC) of the United Kingdom.

Material Analysis in the News

December 31, 2019. A Sacramento, California electricity provider has installed an [experimental cooling system: panels that stay colder than their surroundings](#), even under the blazing hot sun, without consuming energy. The panels emerged from a discovery at Stanford University in California. In 2014, researchers there announced that they had created a material that stayed colder than its surroundings in direct sunlight.

January 6, 2020. [A new study offers a nanoscopic view of complex oxides](#), which have great potential for advanced microelectronics. Analysis from a team led by Argonne researchers reveals never-before-seen details about a type of thin film being explored for advanced microelectronics.

January 8, 2020. Hotter objects typically glow brighter than cooler ones, making them stand out in infrared images. [But a newly designed coating](#) bucks the rule that hotter equals brighter. A coating of samarium nickel oxide counteracts hotter objects' tendency for brighter thermal radiation, and could camouflage objects from infrared cameras.

January 10, 2020. Stanford scientists have developed [a prototype for a nanoscale particle accelerator](#) — a gadget small enough to fit on a chip, and whose miniature size could offer a new approach to cancer therapy while simultaneously increasing scientific access to a highly coveted instrument.

January 13, 2020. Fifty years ago, a meteorite landed in Australia, carrying with it a rare sample from interstellar space. A new analysis of the meteorite revealed stardust that formed between five to seven billion years ago. That makes the meteorite and its stardust [the oldest solid material ever discovered on Earth](#).

January 15, 2020. The Pachacamac Idol of ancient Peru was a multicolored and emblematic sacred icon worshiped for almost 700 hundred years before Spanish

conquest, according to a new study. [Chemical analysis of the statue reveals its age and original polychromatic design.](#)

January 15, 2020. Researchers have created a form of concrete that not only comes from living creatures but—given the right inputs—can turn one brick into two, two into four, and four into eight. [The new concrete is the latest addition to the burgeoning field of engineered living materials \(ELMs\)](#), in which organisms—typically bacteria—are added to inanimate materials to enable them to sense, communicate, and even respond to their environments.

January 17, 2020. [Crystals with ultrahigh piezoelectric performance that are also transparent have been created for first time.](#) The research was undertaken using equipment housed within the X-ray Diffraction Research Technology Platform based in the University of Warwick's Department of Physics.

January 17, 2020. [Scientists have captured video of the intimate dance of two atoms as they bond with one another](#), break apart and come back together again. In a sequence of images from an electron microscope, two atoms of the metal rhenium, bound together to create a molecule, shimmied around one another, moving closer and then farther apart.

January 17, 2020. While the scientists who discovered graphene in 2004 won a Nobel Prize for finding the new “wonder material”, for years, no one was quite sure what to use it for. [That is changing with the help of investment from Abu Dhabi.](#) From electric aeroplanes to easier water desalination, advocates believe graphene will become part of our everyday lives.

January 20, 2020. The Dallas Museum of Art's Conservation and Arts of Africa departments have collaborated with the University of Texas Southwestern Medical Center to learn more about [a fearsome-looking West African helmet mask](#) – inside and out. The komo mask and its CT scans make up the exhibition Not Visible to the Naked Eye: Inside a Senufo Helmet Mask

January 21, 2020. Astrochemists [map phosphorus-bearing molecules](#) in a star-forming cloud, giving clues to how this vital element may have arrived on Earth.

January 22, 2020. China has launched [a new university enrolment scheme](#) that prioritises scientific skills. Academics cheer for end of "exploited" system but urge institutions to learn from experience.

January 22, 2020. A new, extremely efficient [source of terahertz radiation has been developed](#) at TU Wien (Vienna): Lasers turn air into plasma, thereby producing terahertz rays for many possible applications.

January 22, 2020. A team of scientists have created a [mathematical model for what they say is the ideal brew for coffee](#), recommending that a less-is-more approach could lead baristas to produce one heavenly espresso after another, using around a quarter fewer beans.

January 22, 2020. [Mount Vesuvius eruption turned victim's brain to glass.](#) Scientists discover vitrified remains caused by immense 520°C heat of this

AD79 disaster.

January 22, 2020. [A method for producing air-stable 2D materials](#) on an industrial scale is a key step in bringing them to market as flexible electronics, biosensors and in water purification.

January 23, 2020. A re-created version of a mummy's vocal [tract reveals what this ancient Egyptian might have sounded like](#).

January 23, 2020. A materials science professor in UT's Tickle College of Engineering has received a five-year \$1.7 million award from a leading scientific research foundation to pursue cutting-edge work in [the emerging field of quantum materials](#).

January 23, 2020. [The infrared Spitzer Space Telescope](#), considered one of NASA's four "great observatories," will be switched off on 31 January after a 16-year career. It probed some of the earliest galaxies ever seen, charted how they evolved and formed stars, and picked apart the constituents of exoplanet atmospheres.

January 23, 2020. Dallas scientists have developed a fundamentally new approach to cooling things down — by understanding that [twisting and untwisting fibers can result in temperature changes](#).

January 24, 2020. An international team of researchers reports that it has developed a way to [unambiguously identify and count metal atoms in proteins in an efficient and routine way](#). Using it, the team — which included scientists from UB, Hauptman-Woodward Medical Research Institute and others — revealed new information that was there, but previously hidden.

January 24, 2020. A team from Japan's National Institute of Materials Science (NIMS) used spray deposition—a cost-effective, atmospheric fabrication mode—to [create a silicon anode for solid-state batteries](#) that showed performance previously seen only in film electrodes developed by evaporation processes.

January 24, 2020. University of California, Berkeley, scientists [have created a blue light-emitting diode \(LED\)](#) from a trendy new semiconductor material, halide perovskite, overcoming a major barrier to employing these cheap, easy-to-make materials in electronic devices. The researchers also found that these materials are inherently unstable, requiring careful control of temperature and chemical environment to maintain their precise color.

January 26, 2020. Hundreds of years ago, an artist mixed together mineral pigments with oil and a drying additive to make a painting. Today, art conservators at the Eskenazi Museum of Art will examine that painting, now crusted with age, and then [use chemical solvents, analytical tools and intense focus to execute an age-defying regiment](#).

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