



MARCH 2021, ISSUE 93

## WELCOME

The palpable tension of the NASA engineers during the successful live landing of Mars Perseverance Rover a few weeks ago caught the imagination of many. Unsurprisingly so, considering the amount of dedication required to plan, design, build and test such a piece of sophisticated equipment that will eventually provide scientists with valuable information on our neighboring planet.

These extreme feats of engineering and technology not only draw on scientific research already available from planet Earth's scientific community, but also pave the way for new advancements. Extreme atmospheric and gravitational conditions and the payload limitations of the transport vehicle (ATLAS V) mean that the functional instruments on the Rover must be of unique design. Rigaku provides analytical instruments to support research into much of the equipment you might find on a Mars Rover, including solar panels, semiconductor chips, sensors and optics.

In fact, the Perseverance is equipped with an X-ray fluorescence spectrometer called PIXL, not unlike Rigaku's Supermini200, to "seek changes in textures and chemicals in Martian rocks and soil left behind by any ancient microbial life." It is very compact, about the size of a lunchbox, weighing in at 10 pounds. Miniaturization often brings advantages such as increased data storage and reduced power consumption, all factors that technology manufacturers strive to achieve when designing new products.

## UPCOMING RIGAKU EVENTS

### X-ray Computed Tomography Virtual Workshop

April 14, 1 PM | CDT

Join us for a live demonstration of X-ray Computed Tomography (CT) measurements using a high-resolution X-ray microscope. The audience will participate in selecting scanning conditions and compare different results. We will discuss how to optimize various parameters, such as X-ray energy, resolution, scan time and sample preparation. We also encourage the participants to ask questions about the challenges they face with their CT measurements and we will discuss them together.

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## UPCOMING RIGAKU WEBINARS

### X-ray Diffraction Single Crystal Online Users' Meeting

April 7, 8 AM | CDT

We will have talks from our applications team as well as from some of our customers. We aim to make our users' meetings a valuable educational experience for all those who attend, so if you'd like to learn more about your diffractometer, recent and upcoming developments and meet others in our community please join us by registering below.

[Register >](#)

### Technical Seminar in Thermal Analysis (TMA) with Sample Preparation and Setting Methods

April 22, 12:30 AM | CDT

This webinar discusses sample preparation and sample setting in the instrument, showcasing Rigaku's unique differential system on compression, penetration and tensile loading methods. It will also feature applications and the device's optional expandability, such as combining TMA with a humidity generator and cooling options that allows measurement from -150°C.

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## FEATURED JOURNALS & REPORTS



### Journals

#### Powder X-ray Diffraction Basic Course Second Installment: Selection of Equipment Configuration to Obtain High-quality Data

By Masashi Omori, Rigaku Corporation

It is necessary to obtain high-quality data for highly accurate analysis. The characteristics of high-quality data may be high intensity, high resolution, high P/B (peak-to-background ratio), and high S/N (signal-to-noise ratio). Deciding which features are important depends on the purpose of analysis. Therefore, we need to consider measurement conditions after determining the purpose of analysis. Some combinations of sample types and optical systems prevent the desired results from being obtained. Therefore, it is necessary to select the optical systems according to the kinds of samples.

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## FEATURED PRODUCTS

### MiniFlex™

The sixth-generation MiniFlex benchtop X-ray diffractometer is a multipurpose powder diffraction analytical instrument that can determine: crystalline phase identification (phase ID) and quantification, percent (%) crystallinity, crystallite size and strain, lattice parameter refinement, Rietveld refinement and molecular structure.

[Read More >](#)

### Supermini200

Compared to competing XRF systems, the Rigaku Supermini200 spectrometer offers superior fundamental parameters and empirical software capabilities in a high-resolution instrument with a compact footprint. As a high-power benchtop sequential wavelength dispersive X-ray fluorescence (WDXRF) spectrometer, for elemental analysis of oxygen (O) through uranium (U) in almost any material, the Supermini200 system uniquely delivers low cost-of-ownership (COO) with high resolution and lower limits-of-detection (LLD).

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## FEATURED APPLICATION NOTES



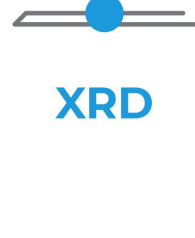
### WDXRF

#### Sulfur Analysis in Petroleum Products by WDXRF According to ASTM D2622-16

Rigaku Corporation

Crude oil contains sulfur in concentration from 0.5 mass% to 5.0 mass% typically, and control of the level of sulfur in refinery intermediates and final products is critical in a refinery. Sulfur in petroleum-based fuels causes atmospheric pollution; therefore, sulfur content in fuels, especially in automobile fuels, is strictly controlled. Sulfur also causes damage to facilities such as catalysts in refinery processes. Therefore, control of sulfur content is very important in the petroleum industry from the standpoints of both environment and production cost.

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### XRD

#### Applications of the Two-dimensional Detector HyPix-3000 in X-ray Diffractometry

Rigaku Corporation

Various types of detectors have previously been used in X-ray diffractometers. Scintillation counters (SC) have been used as zero-dimensional (0D) detectors, position-sensitive proportional counters (PSPC) and semiconductor detectors as one-dimensional (1D) detectors, and devices such as imaging plates (IP) and CCD detectors as two-dimensional (2D) detectors. IP and CCD detectors are 2D detectors still in use today, but they have problems such as slow read-out speed and narrow dynamic range, and thus their applications are limited. The HyPix-3000 hybrid multi-dimensional pixel detector is a 2D detector with the following features not available with IP or CCD detectors.

[Read More >](#)



### EDXRF

#### Ni:Fe Metallurgy

Applied Rigaku Technologies

In the metallurgical production of metals and alloys it is important to ensure proper certain of the major alloy metals, and it is critical to ensure certain harmful tramp elements are at sufficiently low concentration or not present. Applied Rigaku Technologies EDXRF systems offer a simple and non-destructive means of quickly testing ingots and sample slugs to ensure these properties are optimized.

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## FEATURED VIDEO & USEFUL LINK OF THE MONTH



### NASA Live Stream - Earth from Space LIVE FEED | ISS tracker & live chat

View a live feed of Earth from space from a camera aboard the ISS.



### Preview First Mars Helicopter Flights

The eagerly anticipated highlight of the Mars Rover mission will be the launch of "Ingenuity," the helicopter attached to the underside of the Perseverance. The results of the first test of powered flight on another planet will be shown [here](#).

## MATERIALS ANALYSIS IN THE NEWS

**February 23, 2021:** A review paper from Germany aims to address [the status of transition metal-based cathode materials for Mg<sup>2+</sup> and Ca<sup>2+</sup>-based multivalent ion batteries](#) on a critical standpoint, providing a comprehensive overview.

**March 3, 2021:** Significant progress was made in the development of NASA's James Webb Space Telescope—also known as JWST or simply [the Webb](#)—in February 2021, marking the success of its final functional performance tests. The two testing milestones—the comprehensive systems test and the ground segment test—confirmed the observatory's internal electronics are operating as intended. They also verified that it and its four science instruments can send and receive data, moving it closer to its planned launch in October.

**March 9, 2021:** More than 300 grams of meteorite fragments have been found in and around the English town of Winchcombe in Gloucestershire, after a dazzling meteor fireball was seen blazing over the south of the UK on 28 February.

**March 15, 2021:** Researchers at Duke University have revealed long-hidden molecular dynamics that provide [desirable properties for solar energy and heat energy applications](#) to an exciting class of materials called halide perovskites.

**March 29, 2021:** What if one mission could [study the gravitational waves triggered by some of the most violent events in the universe](#)—on the way to observing the least-known planets of our solar system?

**March 29, 2021:** A new black hole breaks the record—not for being the smallest or the biggest—but for being right in the middle.

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