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WELCOME

As we advance into 2021, it is clear that both the global health landscape and how the world engages in science has changed. While the COVID-19 virus is having enormous and direct impacts on health and society, causing permanent changes to the way we work and live, the scientific community has a robust set of tools with which to respond to these challenges.

Musō Soseki, a prominent Zen master of the Muromachi Period, said, "Hardship is a blessing when it spurs effort and development; ease is a curse when it increases complacency and self-indulgence."

With that in mind, we press on, diligent yet optimistic in the assumption that the worst of the health crisis is behind us as we see a vaccine rollout and a welcome light at the end of a long tunnel. In the meantime, please enjoy this first issue of *The Bridge* for 2021, featuring the latest news in materials science as well as application notes for XRD, WDXRF and EDXRF.

UPCOMING RIGAKU EVENTS

ESRF User Meeting 2021

Feb. 8–10, 2021
Virtual Event

Rigaku XRD Forum: Powder Diffraction

Mar. 2–4, 2021
Virtual Conference

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UPCOMING RIGAKU WEBINARS

Precious Metal Determination in Automotive Catalyst Recycling Using Rigaku EDXRF

January 28, 8 AM | CST

In this webinar, we discuss the measurement of Pt, Pd and Rh catalysts in used, recycled automotive catalytic converters using Rigaku Energy Dispersive X-ray Fluorescence (EDXRF) analyzers. Analytical methodologies are discussed, including screening, mixed homogeneous ceramic cats, diesel cats and the use of Rigaku Matching Library software to optimize the measurement of similar families of auto cats and match the XRF to fire assay or ICP values.

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Technical Seminar in Thermal Analysis Focusing on Polymer Applications

February 4, 12:30 AM CST

This webinar will focus on the most common polymer reactions that can be evaluated with thermal analysis methods of STA, DSC and evolved gas analysis.

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Technical Seminar in Thermal Analysis Focusing on Pharmaceutical Applications

February 25, 12:30 AM CST

This webinar will focus on the pharmaceutical applications evaluated by common methods in thermal analysis such as STA, DSC, MTDSC and evolved gas analysis.

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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 and research and development applications. Nanoparticle size, size distribution and particle shape are the key pieces of information obtained from SAXS.

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nano3DX

Rigaku nano3DX is a true X-ray microscope (XRM) with the ability to deliver 3D computed tomography (CT) images of relatively large samples at high resolution. This is accomplished by using a high-powered rotating anode X-ray source and a high-resolution CCD detector. The rotating anode provides for fast data acquisition and the ability to switch anode materials easily to optimize contrast for specific sample types.

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FEATURED APPLICATION NOTES



WDXRF

Lubricating Oil Analysis by WDXRF According to ASTM D6443-14

Rigaku Corporation

Lubricating oil is given functional properties for specific purposes by mixing additives with base oil. Therefore, it is very important to control concentrations of additive elements in lubricating oil production plants. X-ray fluorescence (XRF) spectrometry has been used for quantitative analysis of additive elements such as Mg, P and Zn in lubricating oil owing to the high precision and simple sample preparation of XRF analysis.

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XRD

Crystal Phase Identification of Carbide Tips by Micro-area 2D X-ray Diffraction

Rigaku Corporation

Carbide tools used for cutting are provided with various types of coatings to improve durability. Previously, evaluation of the coating layer has been done using X-ray diffraction, but some users want to achieve rapid and simultaneous evaluation of factors such as site-dependent differences in composition, crystallinity and orientation. These evaluations can be easily done by employing the optical element and detector used in this report.

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EDXRF

Agricultural Soils and Plant Materials

Applied Rigaku Technologies

In the agri-food sector, it is important to not only study the soil composition and use of fertilizers, but also the uptake of nutrients and crops themselves. XRF (X-ray fluorescence) is an accepted technique in the industry. The Rigaku NEX CG meets the challenges of soil and crop analysis using indirect excitation EDXRF (Energy Dispersive XRF).

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FEATURED VIDEO & USEFUL LINK OF THE MONTH



Rigaku Webinar: X-Ray Computed Tomography for Materials & Life Sciences 8: Metrology Applications

Basics of metrology analysis and a number of X-ray CT application examples are discussed. Examples include size and shape measurements of metal and plastic parts, tolerancing evaluation, comparison of nominal (CAD) and actual (CT) or a golden standard and a test subject. We also introduce available resources to learn more about X-ray CT metrology.



SubsTech

A collection of illustrated articles encompassing many areas in materials science information.

MATERIALS ANALYSIS IN THE NEWS

December 22, 2020: Materials science researchers are developing novel instrumentation that could outperform synchrotron-based X-ray absorption spectrometry in giving scientists a clearer picture of elemental composition and chemical bonding at the nanoscale level.

December 30, 2020: After its 5.24-billion-km round trip to asteroid Ryugu, the spacecraft Hayabusa2 landed in the Australian Outback on December 6. Its sample container was transported to Japan, where JAXA scientists will get down to the business of studying the material collected from the surface and sub-surface of the asteroid.

January 4, 2021: Polarons are fleeting distortions in a material's atomic lattice that form around a moving electron in a few trillionths of a second, then quickly disappear. These disruptions, seen for the first time in lead hybrid perovskites, may help explain why these materials are exceptionally good at turning sunlight into electrical current in solar cells.

January 4, 2021: In a new study published in *Nature Physics*, researchers describe how structural defects in self-assembling nacre (mother-of-pearl) attract and cancel each other out, eventually leading to a perfect periodic structure.

January 6, 2021: Lawrence Livermore National Laboratory researchers have developed an X-ray source that can diagnose temperature in experiments that probe conditions like those at the very center of planets. The new source will be used to perform extended X-ray absorption fine structure (EXAFS) experiments at the National Ignition Facility.

January 11, 2021: UC San Diego scientists reported that increased ocean acidity is weakening California mussel shells along the Pacific Coast, a result of rising levels of human-produced carbon dioxide. Mineral profiles were determined by X-ray diffraction analysis.

January 13, 2021: Scientists set a record for the highest conversion rate of carbon dioxide at low temperatures with copper-modified indium oxide, signifying sustainable e-fuel. The results have encouraged scientists about the future prospects of copper-indium oxides.

January 13, 2021: BPA (bisphenol-A) is an organic compound made from fossil fuel sources. It can be found in a variety of products, including water bottles, storage containers and sports equipment and is one of the most commonly synthesized chemicals today. NDSU researchers set out to create BPA alternatives derived from biomass feedstocks versus fossil fuels.

January 14, 2021: Scientists show ultrasonication is a cost-effective approach to enhance the properties of magnesium diboride superconductors. The Rigaku SmartLab X-ray powder diffractometer was used to identify the phase information.

January 14, 2021: A strategy for machine learning has been developed that exploits the fact that data are often collected in different ways with levels of accuracy. The approach was used to build a model that predicts a key property of materials.

January 15, 2021: The University of Buffalo in New York has been awarded a \$2 million, four-year grant from the National Science Foundation's Emerging Frontiers in Research and Innovation program to build a robotic system that will "learn" to sort plastic for recycling.

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