



JUNE 2020, ISSUE 84

WELCOME

Please join Rigaku on Wednesday, July 15 at 1 PM CDT for the next episode of the webinar series [X-ray Computed Tomography for Materials and Life Science: Geology Applications](#). We have covered the basics of X-ray Computed Tomography (CT) and various materials and life science applications in the series so far. In this episode, we will take a look at geological applications. We will discuss how to deal with unique challenges in geological sample segmentation and introduce examples of quantitative analyses such as phase and voids quantification and pore network analysis. Videos of past webinars in this series can be viewed [here](#).

Thanks again to everyone who has joined us for the Rigaku TOPIQ Webinar Series and made it a success. We are pleased to be able to help people stay engaged during these times of limited travel and social contact.

UPCOMING RIGAKU EVENTS

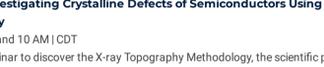
BioTaiwan
Online Event
July 22-26, 2020

Rigaku's Virtual Analytical X-ray Convention
Online Event
August 4-6, 2020

Kaohsiung International Chemtech & Instruments Expo
Kaohsiung, Taiwan
August 6-9, 2020

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UPCOMING RIGAKU WEBINARS

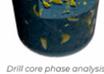


TOPIQ | Investigating Crystalline Defects of Semiconductors Using X-ray Topography

July 7, 3 AM and 10 AM | CDT

Join this webinar to discover the X-ray Topography Methodology, the scientific principles of measurements and the possibilities of the instrumentation. The webinar will focus on applications on different materials and the results, demonstrating how the Rigaku XRTmicron system is used to get highest quality 2D and 3D topograms of semiconductor material.

[Read More >](#)



Drill core phase analysis

X-ray Computed Tomography for Materials and Life Science: Geology Applications

July 15, 1 PM | CDT

A number of X-ray CT application examples of geological samples will be discussed. Examples include the analysis of cracks, pores, inclusions and phase quantification of rocks and drill cores. We will introduce available resources for pore network analysis that can be applied to rock CT scans.

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FEATURED JOURNALS & REPORTS



Journals

Free Lime Quantification in Clinker with Simultaneous Wavelength Dispersive X-ray Fluorescence Spectrometer

By Mitsuru Watanabe, Rigaku Corporation

Cement is used for concrete in construction and architectural structures. Clinker, which is an intermediate material for cement, is produced by mixing and calcinating cement raw materials such as limestone, clay and silica in a rotary kiln at a high temperature. The unreacted calcium oxide remaining after calcination of the clinker is called free lime (f. CaO). When calcination in a rotary kiln is insufficient, limestone, the main raw material, does not react sufficiently with silicon dioxide, aluminum oxide, etc., and the amount of free lime increases, resulting in the cement not meeting the expected composition.

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Journals

Identification of Hazardous Compounds and Illicit Drugs with the Handheld Raman Spectrometers

By Taru Nogami, Rigaku Corporation

Raman spectroscopy is becoming a common method for identification of hazardous compounds and illicit drugs. Historically, infrared absorption spectroscopy was the common method, but the mainstream has gradually shifted to Raman spectroscopy. In particular, Raman spectroscopy has a couple of advantages over infrared spectroscopy for onsite rapid analysis. First, handheld Raman spectrometers can analyze contents through transparent or translucent containers, which infrared absorption spectrometers cannot. Second, Raman spectrometer can analyze wet samples, but infrared absorption spectrometer cannot.

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FEATURED PRODUCTS



NANO HUNTER II

The new, next-generation Rigaku NANO HUNTER II benchtop total reflection X-ray fluorescence (TXRF) spectrometer enables high-sensitivity ultra-trace elemental analysis of liquids down to parts-per-billion (ppb) concentrations. Total reflection X-ray fluorescence spectroscopy is a method by which an incident beam of X-rays just grazes the sample, delivering low-background noise and high-sensitivity measurement of ultra-trace elements.

[Read More >](#)



CT Lab HX

Rigaku CT Lab HX is a high-performance benchtop X-ray micro-CT system with the most powerful X-ray source in its class (130 kV, 39 W). The CT Lab HX has the advantage of a small footprint with low running costs. The powerful X-ray source covers a wide variety of applications, from polymer and bones to electronics and metals, and enables fast data collection at 18 seconds per scan.

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FEATURED APPLICATION NOTES



XRD

Evaluation of Crystallite Size and Pore Size Distribution of Fuel Cell Materials in a Hydrogen Gas Atmosphere

Rigaku Corporation

A fuel cell is made of a membrane-electrode assembly (combination of anode, polymer electrolyte membrane, and cathode) connected to multiple cells consisting of gaskets and separators. Hydrogen and methanol gases supplied at the anode are decomposed into protons and electrons by catalytic reactions. In this reaction, platinum nanoparticles supported on carbon are used as the catalyst. Note that an increase in the average pore size of platinum catalysts is strongly involved with the degradation of fuel cells.

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XRD

Quantitative Analysis of Polymorphic Impurities in a Drug Substance by the Calibration Method Using a Benchtop X-ray Diffractometer

Rigaku Corporation

Polymorphic forms and hydrates are different in solubility and absorption, so it is important to control and evaluate them during drug development and manufacturing. Here is an example where we calculated the amount of polymorphic impurities in a drug substance using a high-speed 1D detector, which can obtain intensity data sufficient for qualitative and quantitative analysis in a short period of time, with a benchtop X-ray diffractometer to obtain diffraction data and perform quantitative analysis by the calibration method.

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WDXRF

Quantitative Analysis of Soda-lime Glass with Supermini200

Rigaku Corporation

Glass is very common material used in various situations with long historical roots. Soda-lime glass is considered to be the first human made glass, and is still being used in many forms such as light bulbs for lamps, touch panels, LCD monitors, solar panels, insulators, tableware, containers, windows and mirrors. Although the basic component of glass is SiO₂, elements such as Na₂O and CaO are added to change the characteristics of the glass depending on the intended use.

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EDXRF

Cl, Pb and Metals in Refuse Derived Fuel

Applied Rigaku Technologies

Refuse Derived Fuel (RDF) is non-hazardous industrial and packaging waste that cannot be recycled, and is comprised of plastics, paper, textiles, rubber and wood. The material is cleaned using mechanical and biological treatments, crushed, and then sorted to extract the PVC and metal impurities. RDF can safely be used as an alternative fuel source instead of fossil fuels in rotary kilns at lime works and cement plants.

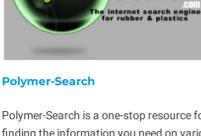
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FEATURED VIDEO & USEFUL LINK OF THE MONTH



Rigaku CT Webinar: X-ray Computed Tomography for Materials Science 2: Data Analysis

An overview of X-ray CT data analysis techniques starting with basic image processing and leading to traditional segmentation, machine learning based segmentation and quantitative analysis. A number of commonly used data analysis and visualization programs will be discussed and demonstrated to help beginners to get an idea of where to start and select the right analysis tool for their needs.



Polymer-Search

Polymer-Search is a one-stop resource for finding the information you need on various aspects within the polymer industry. Here you will find resources related to plastic and rubber products, as well as other polymers, such as PCV, fiberglass, and Teflon.

MATERIALS ANALYSIS IN THE NEWS

May 20, 2020: A study by a team of researchers from Canada and Italy recently published in *Nature Materials* could usher in a revolutionary development in materials science, [leading to big changes in the way companies create modern electronics](#).

June 2, 2020: Rice University scientists and engineers show [boron nitride's promise for composites, biomedical applications](#). They report the first real-time imaging of individualized boron nitride nanotubes (BNNTs) via stabilization with a rhodamine surfactant and fluorescence microscopy.

June 03, 2020: Universal first-principles approach will accelerate [the identification and design of materials for quantum information science](#) and other spintronics applications.

June 4, 2020: Most of the lithium-ion batteries that power electric cars today depend, to some degree, on cobalt. As the market for energy storage grows, the search is on for battery chemistries that rely on cobalt far less, or not at all. Researchers at the U.S. Department of Energy (DOE)'s Argonne National Laboratory are [developing a technology that centers on manganese](#), one of Earth's most abundant metals.

June 11, 2020: A study finds [simple changes in road resurfacing practices could improve gas mileage for heavy vehicles and reduce greenhouse gas emissions](#). The study examined state-by-state data on climate conditions, road lengths, materials properties and road usage, and modeled different scenarios for pavement resurfacing practices.

June 11, 2020: A perennial problem faced by researchers in any field is making their work accessible and meaningful to non-experts. [Art of Science 2020](#), organized by the Stanford Materials Research Society, creates a space for Stanford scientists from all disciplines to [encounter their research creatively by translating their work into a piece of art](#).

Jun 15, 2020: X-ray absorption spectroscopy is a viable way to connect experimental and theoretical results in determining the correlation between stoichiometry and [the efficiency of multi-alkali antimonides in emitting electrons](#).

June 16, 2020: Kazan Federal University, Joint Institute for Nuclear Research (Dubna, Russia), and Khalkov Institute of Archeology (Tatarstan Academy of Sciences, Kazan, Russia) are working together to study [the physical properties of the coins found on the territory of former Volga Bulgaria](#).

June 17, 2020: Recent devastating fires in the Amazon rain forest and the Australian bush highlight the need to detect forest fires at early stages, before they blaze out of control. Current methods include infrared imaging satellites, remote sensing, watchtowers and aerial patrols, but by the time they sound the alarm, it could be too late. Now researchers have developed [self-powered 'paper chips' that sense early fires and relay a signal](#).

June 17, 2020: Bose-Einstein condensates are often described as the fifth state of matter: At extremely low temperatures, gas atoms behave like a single particle. The exact properties of these systems are notoriously difficult to study. In the journal "Physical Review Letters", physicists from Martin Luther University Halle-Wittenberg (MLU) and Ludwig Maximilian University Munich have [proposed a new theory to describe these quantum systems more effectively and comprehensively](#).

June 17, 2020: A new technique, using motion capture technology, developed by University of Minnesota researchers, allows [3D printing of hydrogel-based sensors directly on organs](#), like the lungs, that change shape or distort due to expanding and contracting.

June 17, 2020: A long-sought-after black phosphorus (BP) allotrope of nitrogen has been synthesized at high pressure and high temperature. The discovery of BP-structured nitrogen opens up the possibility of searching for [new high energetic materials with clean decomposition products and layer-structured 2D nitrogen](#).

June 17, 2020: Using NASA's Chandra X-ray Observatory, astronomers have observed [a black hole hurling hot material into space at close to the speed of light](#). The black hole has a mass of about 6.5 billion times that of the sun and is located about 55 million light years from Earth.

June 18, 2020: A new study by materials science engineers at the University of Wisconsin-Madison shows that, in the important ceramic material silicon carbide, [carbon atoms collect at grain boundaries when the material is exposed to radiation](#). The finding could help engineers better understand the properties of ceramics and could aid in fine-tuning a new generation of ceramic materials.

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