



WELCOME

December. While meteorological events like this are a rarity in this part of the state, they seem to be becoming more frequent. The temperatures then rose into the eighties (F = 27C) and have continued to oscillate between near-freezing and tropical ever since. The rains in California over the past weeks have broken many records. This may be what our future looks like, as the climate responds to the things humanity has done to the environment. 2022 was an interesting year, capped off by worldwide interest in the World Cup. Teams that hadn't qualified in decades had a chance to play on the global stage, and other teams that were not expected to perform well surprised everyone and brought a sense of pride to their fans at home. Events like this are a reminder that we all share this fragile planet and do better

We look forward to the new year, a blank slate full of possibility. Pharmaceutical research spurred on by the creation of the mRNA COVID-19 vaccine may translate into vaccines for other diseases. Materials science research may lead to breakthroughs in sustainable energy, new ways of disposing of plastics polluting the oceans, and more environmentally friendly ways of powering transportation. A resurgence in space exploration promises to propel the

human race toward new frontiers. Read on to discover what developments have made the news recently and learn about webinars, podcasts, application notes and a lab tour from Rigaku in the coming weeks and months.

January 6, 2023: A research team has built and tested a new interlayer to prevent dissolution of the sulfur cathode in lithium-sulfur batteries. This new interlayer increases Li-S cell

January 11, 2023: About a quarter of the world's electricity currently comes from power

plants fired by natural gas. These contribute significantly to global greenhouse gas emissions

the emissions by country, a team has estimated that total global carbon dioxide emissions

capacity and maintains it over hundreds of cycles.

amount could be reduced by as much as 71% if a variety of mitigation options were used January 12, 2023: A new study demonstrates that electrodes can be made using just screen

hospitals or at home. Current commercial manufacturing of wearable electronics requires expensive processes involving clean rooms. While some use screen printing for parts of the process, this new method relies wholly on screen printing, which can make manufacturing flexible, wearable electronics much easier and less expensive. January 17, 2023: Chemists cracked the code to long-lasting Roman concrete, which could be a boon to the planet. The Pantheon and its soaring, detailed concrete dome have stood nearly 2,000 years, for instance, while modern concrete structures have a lifespan of perhaps

WEBINAR

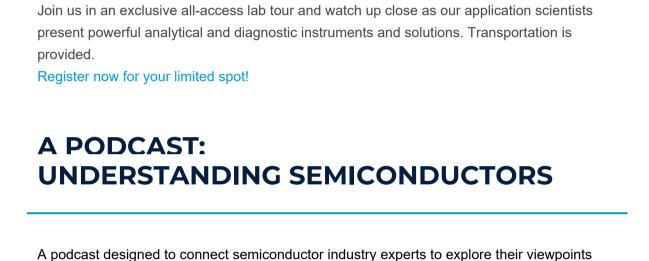
 (\mathcal{Q}) Rigaku

JOINT WEBINAR Analytical Methods to Ensure Battery Raw Material

Thursday, February 02, 2023 🕑 2:00 PM Central European Time 🔀 1 hour

Joint Advanced Battery Webinar: ANALYTICAL METHODS TO ENSURE BATTERY RAW MATERIAL AND ELECTRODE Do you want reliable tools to predict battery electrode quality and performance in development and production? Do you want to reduce scrap and increase process yield? The use of appropriate analytical technologies can allow you to accelerate electrode design based on new formulations and processes, and reliably control product quality. Rigaku and Micromeritics will together show how X-ray and physical textural analysis technologies can provide reliable determinations of density, elemental purity, surface area, porosity, and crystal structure that are essential to a high-quality anode or cathode.

Thursday, February 2, 2023 - 07:00 CST



A RIGAKU EVENT LAB TOUR

Thursday, March 30, 2023 from 2–6 pm CET Rigaku Laboratory, Neu-Isenburg, Germany **REGISTER NOW**

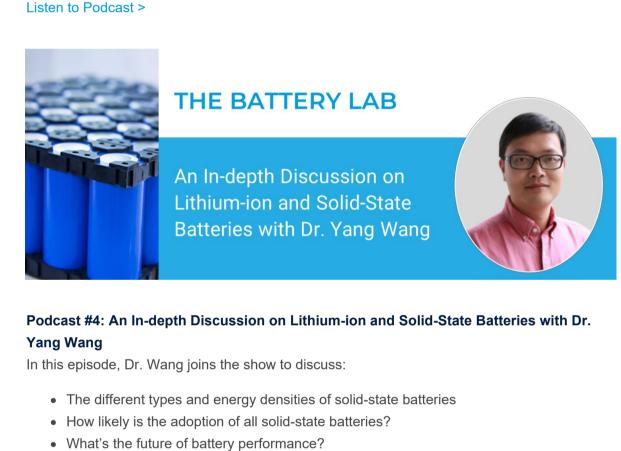
The annual meeting of the DGK will take place in Frankfurt from March 28 to 30, 2023-a stone's throw away of RESE's state-of-the-art laboratories in Neu-Isenburg-giving you the perfect opportunity to experience Rigaku's products and scientists on site and in effect.

Q Rigaku UNDERSTANDING **SEMICONDUCTORS**

about modern metrology from Lab to Fab for engineering leaders in characterization,

metrology, process, and analytics, looking for discussion around semiconductor metrology

Each episode will feature a conversation with technology experts about problems facing the



The exciting current trends in the lithium-ion battery industry

FEATURED APPLICATION NOTES

Aluminum and steel are often coated with a protective conversion coating, also called passivate or passivation

window frames, and other similar industries where the

retention of paint for the final finished product.

Chromium on Aluminum Applied Rigaku Technologies

aluminum is demonstrated.

Titanium on Aluminum Applied Rigaku Technologies

aluminum is demonstrated.

Zirconium on Aluminum Applied Rigaku Technologies

aluminum is demonstrated.

rocking curve measurement

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aluminum is exposed to weathering. Steel for the automotive industry is typically first galvanized with a zinc coating before the conversion coating is applied. Protected steel is also used for outdoor sheds and other similar uses where steel is exposed to weathering. Conversion coating also helps in the

The measurement of chromium (Cr) conversion coating on

The measurement of titanium (Ti) conversion coating on

The measurement of zirconium (Zr) conversion coating on

Twist width evaluation of group III-V nitride films by

coating, to prevent oxidation and corrosion of the base metal. Conversion coatings include chromium (Cr), titanium (Ti), vanadium (V), manganese (Mn), nickel (Ni), phosphorus (P), or zirconium (Zr). A phosphate coating may also be applied to minimize wear on cutting tools and stamping machines. Aluminum is often coated for use in aircraft parts, aluminum

function G(r) in the short-distance region from zero to the nearest neighbor. However, the observed G(r) in this region is greatly affected by unphysical modulation of the experimental scattering data and the derived structure factor S(Q). As a result, the estimated microscopic density has a large uncertainty. The proposed method removes the unphysical modulation of S(Q) and obtains a G(r) that satisfies theoretical conditions only using the coherent scattering intensity and the first neighbor distance. We have applied the present method to SiO₂ glass, crystalline Ni powders, and a set of data from germinate glasses whose densities have been reported. The results of the present method are consistent with the reported values within



XRD

Deep ultraviolet LEDs are preferable for wide use as an alternative to mercury lamps since they are ultraviolet sources with low environmental impact. In recent years, their sterilization function has been especially attracting great attention, and practical application of this function is expected soon. Ro increase light emission efficiency and carrier lifetime, the quality of the AIN layer, which is the base for the active layer, must be improved. In this measurement example, an appropriate evaluation method was examined for the crystal orientation distribution (twist width) in the in-

plane direction, which is used as an indicator of the threading edge dislocation density of the AIN layer.

Chlorine Analysis of Aluminosilicate for Fluid

Catalytic Cracking Catalyst by WDXRF

It is important to control the chlorine content of FCC catalyst to guard against the formation of hazardous organo-chloride compounds such as dioxins and to prevent degradation of catalytic activity. This application note documents the performance of a Rigaku ZSX Primus IV spectrometer for analysis of chlorine in FCC aluminosilicate catalyst. Read More > **Benchtop WDXRF Supermini200** Rigaku Corporation

Although lead-free gasoline, called unleaded gasoline, is either unintentionally or intentionally—in some countries. gasoline. This application note demonstrates quantitative analysis of low concentration lead in gasoline according to ASTM D5059-21 on Rigaku Supermini200, a benchtop

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Rigaku Corporation

Lead Analysis in Gasoline — ASTM D5059-21 — Using common in most countries, lead occurs as a contaminant— Therefore, it is necessary to check the lead concentration in

wavelength dispersive X-ray fluorescence (WDXRF) spectrometer. Read More > Subscribe to Rigaku newsletters!

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Welcome to the first issue of *The Bridge* for 2023. It's almost a cliché to start by talking about the weather, but it has been an interesting winter thus far. Southeast Texas, where Rigaku Americas Corporation has its headquarters, experienced a two-day hard freeze in late

as a species when we recognize everyone else's place in the world.

IN THE NEWS

and climate change. By gathering data from 108 countries around the world and quantifying from the life cycle of gas-fired power is 3.6 billion tonnes each year. They found that this

around the world.

printing, creating a stretchable, durable circuit pattern that can be transferred to fabric and worn directly on human skin. Such wearable electronics can be used for health monitoring in

150 years, and that's a best case scenario. And the Romans didn't have steel reinforcement

bars shoring up their structures. January 17, 2023: A paper published in the journal Nano Letters describes a key advance: the development of a kind of on-chip "factory" for producing a steady, fast stream of single photons, essential to enabling photonic-based quantum technologies.

mi micromeritics and Electrode Performance

RIGAKU LAB TOUR DURING DGK

Date/time

Register >

RIGAKU SEMICONDUCTOR METROLOGY DIVISION Podcast #9: Suman Datta - Advanced Computing and Georgia Research Alliance WHAT IS THE NEXT BIG THING IN THE SEMICONDUCTOR INDUSTRY? (PART 2)

Transistor Scaling

 Metrology CMOS

challenges.

semiconductor metrology industry.

Suman Datta

Joseph M. Pettit Chair Professor in Advanced Computing at Georgia Tech

FEATURED ARTICLE Determination of Atomic-Scale Density of Materials from Total Scattering Profiles by Masatsugu Yoshimoto and Kazuhiko Omote Atomic-scale density (microscopic density) for non-crystalline materials is sometimes hard to obtain when the sample contains microscopic grains and/or pores. This is also the case for crystalline materials that contain atomic scale defects. We propose a method for the determination of the microscopic density of an amorphous sample from total scattering data. Theoretically, the microscopic density can be calculated from the slope of the pair distribution

Listen to Podcast >

±5%.

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