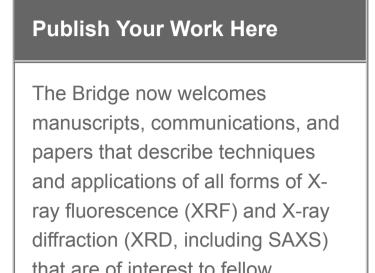


HOTO BY PAUL SWEPSTON

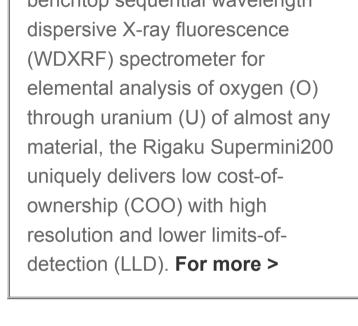


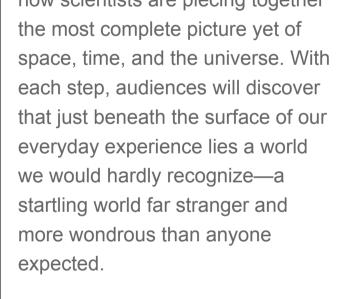
crystals, or gels with ordered and disordered structures, and diverse applications including nanoparticle size distribution analyses, threedimensional protein molecule structure analyses, identification of molecular assembly or disassembly and research of advanced materials, such as carbon fiberreinforced plastics (CFRP). For more > Interested in publishing your



commercial in nature. Authors are responsible for all statements made in their work. If illustrations or other material in a manuscript have been published previously, the author is responsible for obtaining permission to republish. Please send copy to the editor at Rigaku.newsletter@Rigaku.com Elemental analysis of solids, liquids, powders, alloys and thin films

As the world's only high-power dispersive X-ray fluorescence





Brian Greene is going to let you in

deceived. Our perceptions of time

Much of what we thought we knew

about our universe—that the past

future is yet to be, that space is just

an empty void, that our universe is

the only universe that exists—just

Interweaving provocative theories,

experiments, and stories with

crystal-clear explanations and

imaginative metaphors like those

that defined the groundbreaking

might be wrong.

has already happened and the

on a secret: We've all been

and space have led us astray.

Norwegian X-ray Conference Fevik, Norway

Sacramento, CA

September 5 - 7, 2016

September 6 – 9, 2016

Labelexpo Americas

September 13 - 15, 2016

See the complete list >

Rosemont, Illinois

shows:

Join Rigaku

at future meetings

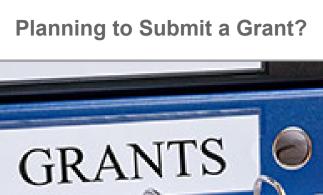
Rigaku will be sponsoring,

attending or exhibiting at the

following conferences and trade

Continuing Challenge HAZMAT





Rigaku is happy to assist

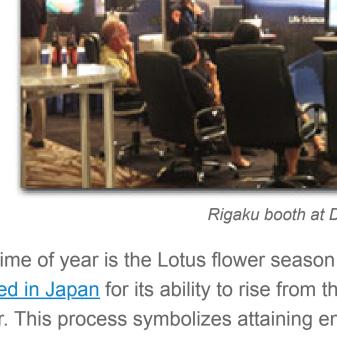
Join us Each month, Rigaku distributes two eNewsletters: The Bridge, which focuses on Materials Analysis, and Crystallography Times, which concentrates on life sciences. Join us >

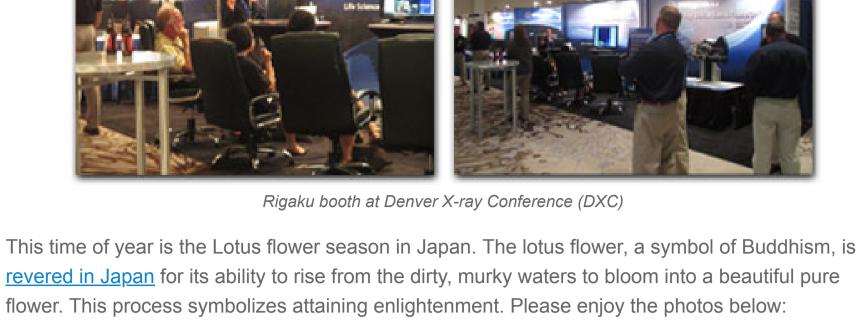
at the Westin O'Hare Hotel, Rosemont, IL during the first week of August. Attended by over 300

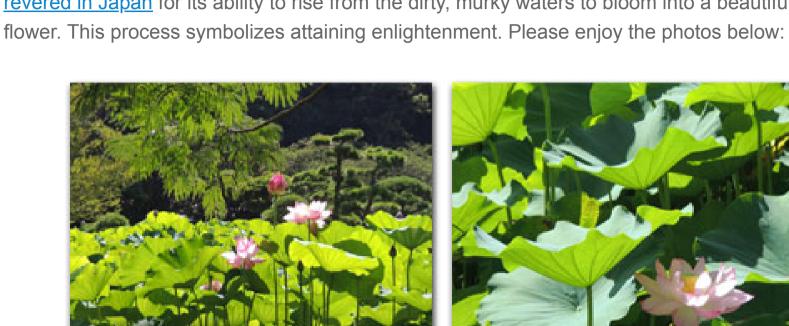
Welcome

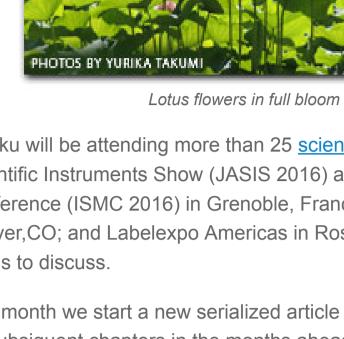
scientists from 29 countries, this conference featured 45 exhibitors and the usual plethora of oral sessions, workshops and posters. We wish to congratulate Alan C. Huber, winner of the 2016 Birks Award, as well as Matteo Leoni and Paolo Scardi, winners of the 2016 Hanawalt Award. A link to a report on this year's DXC may be found be below.

We want to thank everyone who visited Rigaku at the 65th annual Denver X-ray Conference (DXC)











GI-XRD." The video topic this month continues our "outer space" theme with "The Fabric of the Cosmos," a four-hour television series, produced by PBS/NOVA in 2012 and based on the book by renowned physicist and author Brian Greene. This month's featured XRD AppNote concerns the "Measurement with fluorescent X-ray reduction

Enjoy the newsletter.

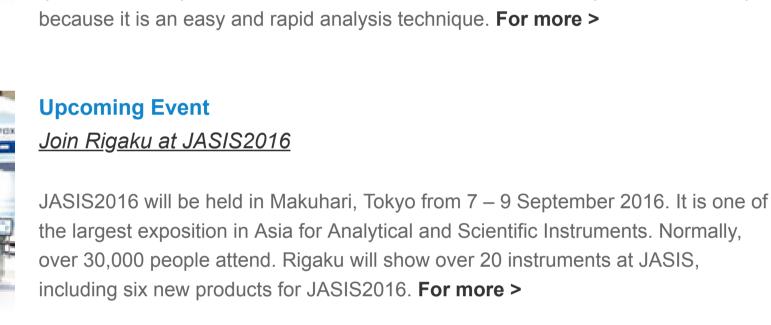
R.C. Tisdale, Ph.D. – Editor nku joui **Featured XRD Rigaku Journal Article**

Introduction to XRD analysis of modern functional thin films using a 2-dimensional detector—(1) GI-XRD By Shintaro Kobayashi and Katsuhiko Inaba, Rigaku Corporation

The development of new functional thin films and the fabrication of functional devices using these materials are the outgrowth of emerging demands for high

Introduction By Pol De Pape, XRF Application Scientist, Rigaku Latin America

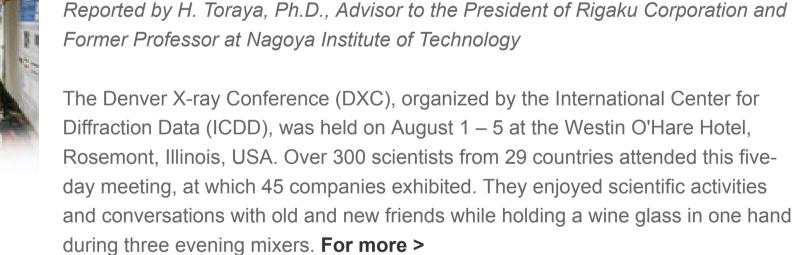
the devices' performance. For more >



physicists, and engineers. In part, this appeal comes from the astounding properties of "soft materials". Soft materials are important in a wide range of technological applications. They

Meet Rigaku at ISMC2016

Upcoming Event



may appear as structural and packaging materials, foams and adhesives,

detergents and cosmetics, paints, food additives, lubricants and fuel additives,



Quantitative Analysis of Stainless Steel using the ZSX PrimusIII+ Rigaku Corporation Alloy steel with chromium as the alloying element added is called stainless steel. Its advantage is not to rust or corrode as easily as ordinary steel. There are over 150 grades of stainless steel, which have many applications such as cookware and major appliances. Alloy steels are generally produced using electric furnaces. The

concentrations of elements in molten steel are controlled in the process of steel

required. As part of the control of the steel making process, analyses of slag and

fluorescence spectrometers are the most common analysis tools to analyze steel

owing to rapid analysis and the ability to measure both bulk metal and powders.

making, therefore rapid and accurate analysis of elemental compositions are

raw materials such as quicklime and ferroalloys are also required. X-ray

Applied Rigaku Technologies Paper and plastic are coated with a thin layer of silicone as a release coating in the manufacture of labels, tape or other adhesives, or as a barrier coating for protection against air in the packaging of food, medical products and other materials. When coating is too heavy silicone material is needlessly wasted, while too little coating may not meet the product spec. In order to achieve reliable QA/QC, Rigaku offers the NEX QC+ EDXRF analyzer. Simple to operate, the NEX QC+ gives the QC technician an ideal tool for quickly checking silicone coat weight

elements, it is difficult for recyclers to accurately verify grades using old methods. For more > **Scientific Book Reviews** <u>Unlocking the Clubhouse: Women in Computing and Rise of the Rocket</u> Girls: The Women Who Propelled Us, From Missiles to the Moon to Mars This month's theme is women in science. I came across *Unlocking the Clubhouse* listening to Fresh Air and Rise of the Rocket Girls listening to Science Friday, both

insight into overcoming the "but you're a girl" mentality of many people.

method to replace the conventional graphite as electrode material for lithium-ion batteries. This material has a long technological lifespan as it can last as long as it is well-kept under moisture free condition. August 5, 2016. The Ostwald ripening process can be used to make large-grain, high-quality perovskite thin films from lower-quality, hole-ridden ones. So say researchers from Shanghai Jiao Tong University (SJTU) in China and the National Renewable Energy Laboratory (NREL) in Colorado in the US who have used their films to make high-performance solar cells with nearly 20% power-conversion

August 5, 2016. Peter Zalden and Michael Shu, from the SLAC National

Accelerator Laboratory in California, and colleagues fired a train of picosecond light

pulses in the terahertz frequency range at a common chalcogenide. Following the

pulse exposure, crystalline filaments appeared in the sample, as confirmed with X-

ray diffraction. The presence of crystallization implies that threshold switching takes

August 5, 2016. One of the hottest new materials is a class of porous solids known

introduced in the 1990s. Now, a surprising discovery by scientists in Canada and

Russia reveals that MOFs also exist in nature – albeit in the form of rare minerals

solution for identifying the material composition of a complex, optically thick object

as metal-organic frameworks, or MOFs. These man-made materials were

less than a picosecond to occur, which could prove important for the development

of the measured X-ray scatter must be determined concurrently. To overcome this difficulty, Dr. Joel Greenberg at Duke University developed a new, flexible approach to performing home lab XRDT with off-the-shelf components. Rather than filtering the scatter, he place a coded aperture between the object and the detectors and intentionally modulated the scatter.

August 10, 2016. X-ray diffraction tomography (XRDT) provides an attractive

Institute of Technology in Japan, Professor Hosono is best known for his discovery August 22, 2016. Researchers in the Cockrell School of Engineering at The University of Texas at Austin, led by Delia Milliron – an associate professor in the

McKetta Department of Chemical Engineering, have invented a new flexible smart

window material that, when incorporated into windows, sunroofs, or even curved

August 23, 2016. A new material that could be used as a superconductor and for

hydrogen-fuel cell storage has been created by US scientists. The research details

how scientists have managed to force hydrogen into a metallic state. Scientists are

interested in creating metallic hydrogen as it will allow super-conductors to be used

August 24, 2016. An international team of astronomers including Carnegie's Paul

Butler has found clear evidence of a planet orbiting Proxima Centauri, the closest

star to our Solar System. The new world, designated Proxima b, orbits its cool red

its surface, if it were present. This rocky world is a little more massive than the

Nanostructured Semiconducting Materials Group at the International Center for

Materials Nanoarchitectonics (MANA), National Institute for Materials Science

August 24, 2016. A research group led by Naoki Fukata, a leader of

Quantitative XRD Analysis of Binary Blends of Siliceous Fly Ash and Hydrated Cement.

Bhagath Singh, G. V. P.; Subramaniam, Kolluru V. L. Journal of Materials in Civil Engineering.

Study on the property of the production for Fengdongyan kiln in Early Ming dynasty by

Instruments & Methods in Physics Research Section B. Aug2016, Vol. 381, p52-57. 6p. DOI:

Mehdi; Shiva, Mohammad. *Measurement* (02632241). Aug2016, Vol. 90, p20-24. 5p. DOI:

INAA and EDXRF. Li, L.; Huang, Y.; Sun, H.Y.; Yan, L.T.; Feng, S.L.; Xu, Q.; Feng, X.Q. Nuclear

Determination of the thorium potential in Shah-Kooh area in Iran by NAA and comparison

Qualitative and quantitative characterization of a coal power plant waste by TG/DSC/MS,

XRF and XRD. Fernández, Josefa; González, Fernando; Pesquera, Carmen; Neves Junior, Alex;

Viana, Marcelo; Dweck, Jo. Journal of Thermal Analysis & Calorimetry. Aug2016, Vol. 125 Issue 2,

Identifying a descriptor for *d*-orbital delocalization in cathodes of Li batteries based on x-

An insight into real and average structure from diffuse X-ray scattering – a case study.

Krzysztof. Acta Crystallographica: Section B, Structural Science, Crystal Engineering & Materials.

Study of gradient copolymers auto-association in supercritical CO₂ thanks to synchrotron

and in-house small-angle X-rays scattering measurements. Gasc, F.; Corso, B.; Causse, J.;

Lacroix-Desmazes, P. *Journal of Supercritical Fluids*. Aug2016, Vol. 114, p26-31. 6p. DOI:

Chodkiewicz, Michal Leszek; Makal, Anna; Gajda, Roman; Vidovic, Dragoslav; Wozniak,

Aug2016, Vol. 72 Issue 4, p571-583. 12p. DOI: 10.1107/S2052520616005552.

ray Compton scattering. Barbiellini, B.; Suzuki, K.; Orikasa, Y.; Kaprzyk, S.; Itou, M.; Yamamoto,

with the results of ICP and XRF techniques. Tousi, Ehsan Taghizadeh; Firoozabadi, Mohammad

Aug2016, Vol. 28 Issue 8, p1-7. 7p. DOI: 10.1061/(ASCE)MT.1943-5533.0001554.

parent star every 11 days and has a temperature suitable for liquid water to exist on

Earth and is the closest exoplanet to us; it may even be the closest possible abode

at higher temperatures – currently they only work at temperatures lower than

-210°C.

10.1016/j.nimb.2016.05.027.

10.1016/j.supflu.2016.04.002.

DOI: 10.4271/2016-01-0420.

10.1016/j.measurement.2016.04.020.

p703-710. 8p. DOI: 10.1007/s10973-016-5270-8.

for life beyond our own Sun.

glass surfaces, will have the ability to control both heat and light from the sun.

(NIMS), Japan, and a research group at the Georgia Institute of Technology, US, jointly developed an anode material for lithium (Li)-ion rechargeable batteries by forming nanoparticles made of silicon (Si)-metal composites on metal substrates. **Recent Scientific Papers of Interest** Papers for August 2016

K.; Yung Jui Wang; Hafiz, H.; Yamada, R.; Uchimoto, Y.; Bansil, A.; Sakurai, Y.; Sakurai, H. Applied *Physics Letters*. 8/15/2016, Vol. 109 Issue 7, p1-5. 5p. 1 Chart, 2 Graphs. DOI: 10.1063/1.4961055. Evaluation of Grain Size by Small-Angle X-Ray Scattering for a Block Copolymer Film in Which Cylindrical Microdomains Are Perpendicularly Oriented. Ohnogi, Hiroshi; Sasaki, Sono; Sakurai, Shinichi. *Macromolecular Symposia*. Aug2016, Vol. 366 Issue 1, p35-41. 7p. DOI: 10.1002/masy.201650044.

Minelli, Caterina; Krumrey, Michael. *European Polymer Journal*. Aug2016, Vol. 81, p641-649. 9p. DOI: 10.1016/j.eurpolymj.2016.01.012. Microstructural evolution and mechanical properties on an ARB processed IF steel studied

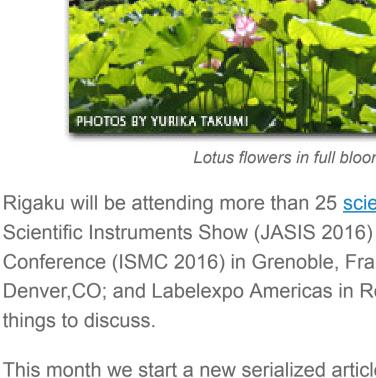
Crystal structure and tautomerism of Pigment Yellow 138 determined by X-ray powder diffraction and solid-state NMR. Gumbert, Silke D.; Körbitzer, Meike; Alig, Edith; Schmidt, Martin U.; Chierotti, Michele R.; Gobetto, Roberto; Li, Xiaozhou; van de Streek, Jacco. Dyes & Pigments. Aug2016, Vol. 131, p364-372. 9p. DOI: 10.1016/j.dyepig.2016.03.035.

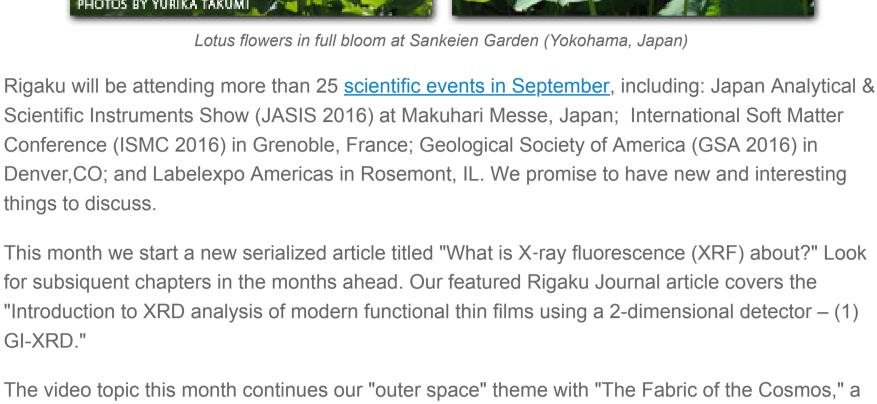
Equation of state for technetium from X-ray diffraction and first-principle calculations. Mast, Daniel S.; Kim, Eunja; Siska, Emily M.; Poineau, Frederic; Czerwinski, Kenneth R.; Lavina, Barbara; Forster, Paul M. Journal of Physics & Chemistry of Solids. Aug2016, Vol. 95, p6-11. 6p. DOI: 10.1016/j.jpcs.2016.03.007.

XRD Raman analysis and optical properties of CuS nanostructured film. Hurma, T.; Kose, S. Optik - International Journal for Light & Electron Optics. Aug2016, Vol. 127 Issue 15, p6000-6006. 7p. DOI: 10.1016/j.ijleo.2016.04.019.

nanoparticle enhanced laser induced breakdown spectroscopy (NELIBS). De Giacomo, A.; Dell'Aglio, M.; Gaudiuso, R.; Koral, C.; Valenza, G. JAAS (Journal of Analytical Atomic Spectrometry). Aug2016, Vol. 31 Issue 8, p1566-1573. 8p. DOI: 10.1039/c6ja00189k. Rapid quantitative determination of major and trace elements in silicate rocks and soils

employing fused glass discs using wavelength dispersive X-ray fluorescence spectrometry. Krishna, A. Keshav; Khanna, Tarun C.; Mohan, K. Rama. Spectrochimica Acta Part B. Aug2016, Vol. 122, p165-171. 7p. DOI: 10.1016/j.sab.2016.07.004.





mode of D/teX Ultra." Additional applications notes include WDXRF, EDXRF and LIBS technologies. Check out the book review, news and papers sections at the bottom of the page for the latest developments in materials science. And a report on last month's American Crystallography Association (ACA) conference is a bonus article for your enlightenment.

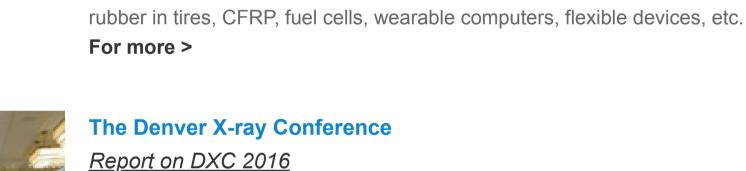
efficiency, energy-saving, lightweight devices to further the pursuit of comfort and convenience in daily life. The "Smartphone" is a typical example, where numerous functional thin film based devices are employed, such as, display screens, backlighting, batteries, data storage devices, etc. Characterization of functional thin films is necessary in terms of not only the phase identification of composing materials but also further crystallographic characterization of constituent crystals,

such as their textures or orientation relationships with substrates, lattice distortions,

film thicknesses etc., since these physical parameters are closely correlated with

Featured XRF Article – What is X-ray fluorescence (XRF) about?

XRF is a spectroscopic method for elemental analysis of materials, based on the principle of X-Ray fluorescence. It is one of the most commonly used methods for qualitative and quantitative determination of the elemental composition of a sample,



Report on DXC 2016 Workshops Reported by Kosuke Kawakyu, XRF Application Scientist, Rigaku Corporation One of the distinguishing hallmarks of the Denver X-ray Conference is the workshops run by experts from both industry and academia during the first two days. A broad range of topics, such as basic and advanced XRF/XRD analysis, Rietveld, XAFS, imaging, structure solution, amorphous & disordered materials, is

covered by almost 40 instructors. With a total of 24 sessions held this year,

beginners to experienced professionals could be sure to discover new and

Workshops at Denver X-ray Conference

XRD Application Note

(MiniFlex300). For more >

WDXRF Application Note

For more >

LIBS Application Note

Rigaku Analytical Devices

For more >

Material Analysis in the News

News for August 2016

of phase-change memory.

found so far only in Siberian coal mines.

Accurate Identification of Light Elements

in Copper Alloys Using Handheld Libs

Measurement with fluorescent X-ray reduction mode of D/teX Ultra Rigaku Corporation Powder X-ray diffractometers are used in many fields of industry and research, for substances ranging from inorganic materials such as ceramics and minerals, to pharmaceuticals and other organic materials. The MiniFlex Series is a line of benchtop instruments – with 1/20 the volume, and 1/10 the weight, of stand-alone powder X-ray diffractometers – that can operate with power from an AC 100 V outlet. The current models in the MiniFlex Series include a high-power model type

with a maximum rated output of 600 W (MiniFlex600), and a reduced-utility model,

which requires no water facilities and only generates 300 W of output power

EDXRF Application Note Silicone Coating on Paper and Plastic

Copper (Cu) is one of the most commonly used metals in various applications dating back thousands of years. Pure copper is most commonly used in electrical applications because of its superior conductivity, ductile form, and corrosion resistance. In addition, there are over 400 different Cu alloys – including brasses, bronzes, and cupronickel – used in construction, plumbing, and transportation. Because copper-based alloys are so common and are made up of various light

on NPR. I highly recommend fathers of young girls read both books as they give

August 1, 2016. Japan's National Institute for Materials Science has developed a

flexible, organic/metal hybrid polymer display that you can cut without wrecking it.

The technology only needs a few seconds of power to adjust to its new shape, and

it even maintains its last information when you switch it off, a lot like e-paper.

August 3, 2016. A novel, low cost and green lithiated tin vanadium oxide

- throughout its volume. However, it requires that the location and deflection angle August 15, 2016. Lawrence Livermore National Laboratory scientists have

combined X-ray diffraction and vibrational spectroscopy measurements together

magnesium chloride. The team observed an extensive stability of MgCl₂ under

with first-principle calculations to examine the high-pressure structural behavior of

the conditions in which they're synthesized affect carbon capture. August 22, 2016. When you watched the crisp feeds of the Rio 2016 Olympics on your flat-panel LCD display screen, you may not know that this is partly the contribution of pioneering materials scientist Hideo Hosono. Based at the Tokyo of iron-based superconductors and for pioneering the development of a type of semiconductor called transparent oxide semiconductors (TAOS).

processing – or "sweetening" – of natural gas. The lab of Rice University chemist

Andrew Barron led a project to map how changes in porous carbon materials and

Solution X-ray Scattering Form-Factors with Arbitrary Electron Density Profiles and Polydispersity Distributions. Ben-Nun, Tal; Asor, Roi; Ginsburg, Avi; Raviv, Uri. Israel Journal of Chemistry. Aug2016, Vol. 56 Issue 8, p622-628. 7p. DOI: 10.1002/ijch.201500037.

by X-ray diffraction and EBSD. Cruz-Gandarilla, Francisco; Salcedo-Garrido, Ana María; Bolmaro, Raúl E.; Baudin, Thierry; De Vincentis, Natalia S.; Avalos, Martina; Cabañas-Moreno, José G.; Mendoza-Leon, Héctor. *Materials Characterization*. Aug2016, Vol. 118, p332-339. 8p. DOI: 10.1016/j.matchar.2016.05.025.

Characterization of Residual Stresses on Steel Coil Springs via X-Ray Diffraction

Aug2016, Vol. 114, p179-187. 9p. DOI: 10.1016/j.apradiso.2016.05.019.

Techniques. Cuccia, Frank Anthony; Pineault, James; Belassel, Mohammed; Brauss, Michael.

SAE International Journal of Materials & Manufacturing. Aug2016, Vol. 9 Issue 3, p649-652. 4p.

Determination of liquid's molecular interference function based on X-ray diffraction and

dual-energy CT in security screening. Zhang, Li; YangDai, Tianyi. Applied Radiation & Isotopes.

Crystal structure of anhydrous tripotassium citrate from laboratory X-ray powder diffraction data and DFT comparison. Rammohan, Alagappa; Kaduk, James A. Acta Crystallographica:

Analysis of X-ray diffraction curves of trapezoidal Si nanowires with a strain distribution.

Measurements of Residual Stresses in Aluminum Wheels Using the Techniques of XRD, Strain Gages and FEA Simulation – A Comparison. Cione, Francisco C.; Souza, Armando; Martinez, Luiz; Rossi, Jesualdo; Betini, Evandro Giuseppe; Rola, Fabio; Colosio, Marco A. SAE International Journal of Materials & Manufacturing. Aug2016, Vol. 9 Issue 3, p685-687. 3p. DOI:

Investigation of the effects of anisotropic pores on material properties of insulating concrete using computed tomography and probabilistic methods. Chung, Sang-Yeop; Elrahman, Mohamed Abd; Stephan, Dietmar. Energy & Buildings. Aug2016, Vol. 125, p122-129. 8p. DOI: 10.1016/j.enbuild.2016.05.006.

橋THE BRIDGE The Grunwald Bridge (Wrocław, Poland) **MATERIALS ANALYSIS eNEWSLETTER** AUGUST 2016, ISSUE 38

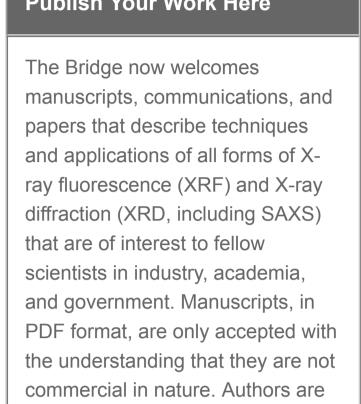


Small angle and wide angle



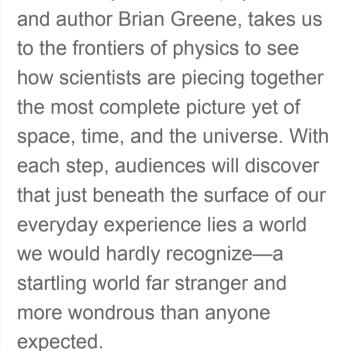
including solids, liquids, liquid-

work in The Bridge?



Supermini200

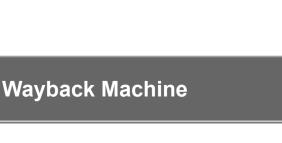
FABRIC O



"The Fabric of the Cosmos," a four-

hour television series, produced by

PBS/NOVA in 2012 and based on



The Wayback Machine is a digital

other information on the Internet

nonprofit organization, based in

States. The Internet Archive

San Francisco, California, United

launched the Wayback Machine in

Brewster Kahle and Bruce Gilliat,

and is maintained with content from

Alexa Internet. The service enables

users to see archived versions of

web pages across time, which the

archive calls a "three dimensional

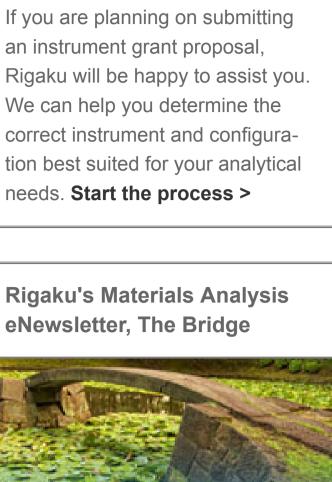
archiving cached pages of web

index". Since 1996, they have been

October 2001. It was set up by

created by the Internet Archive, a

archive of the World Wide Web and



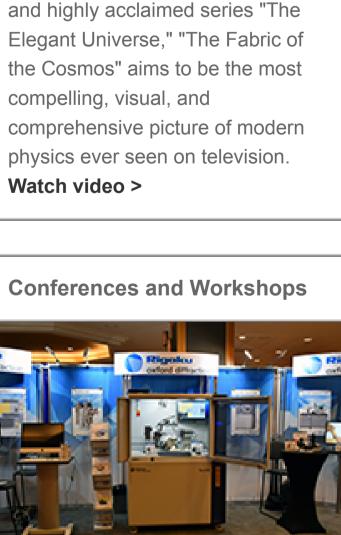
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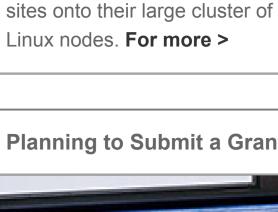
benchtop sequential wavelength

Video of the Month

COSMOS

the book by renowned physicist





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The 4th International Soft Matter Conference (ISMC2016) will be held in Grenoble, France from 12 – 16 September 2016. Soft matter science is a growing and interdisciplinary field of research, attracting equal attention from chemists,

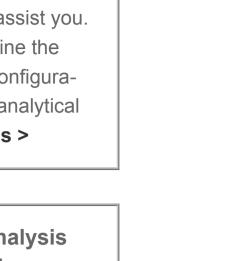






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10.4271/2016-01-0426.

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Takeuchi, Teruaki; Tatsumura, Kosuke; Shimura, Takayoshi; Ohdomari, Iwao. *Thin Solid Films*. Aug2016, Vol. 612, p116-121. 6p. DOI: 10.1016/j.tsf.2016.05.047.

Like

The 66th Annual Meeting of the American Crystallographic Association (ACA) was held in Denver, Colorado from Friday, July 22nd – Tuesday, July 26th. There were a total of 560 attendees at the meeting and 36 exhibitors. For more >

in order to maintain the highest product quality with minimal costs. For more >

compound has been synthesized via simple, economical and scalable sol-gel efficiency.

pressure that contradicts the well-established structural systematics. **August 17, 2016.** Kyoto Institute of Technology, together with a Japanese corporate partner and a representative Japanese lacquerware artist, Dr. Yutaro Shimode, announced today the development of a bioplastic using cellulose resin from grasses, trees and other non-edible plant resources that features the highly regarded "Urushi black" color of Japanese traditional lacquerware. **August 22, 2016.** A careful balance of the ingredients in carbon-capture materials would maximize the sequestration of greenhouse gases while simplifying the

Recent Scientific Papers of Interest is a monthly compilation of material analysis papers appearing in recently released journals and publications. See below

Simultaneous size and density determination of polymeric colloids by continuous contrast variation in small angle X-ray scattering. Garcia-Diez, Raul; Sikora, Aneta; Gollwitzer, Christian;

Section E. Aug2016, Vol. 72 Issue 8, p1159-1162. 9p. DOI: 10.1107/S2056989016011506. Bragg-Laue X-ray dynamical diffraction on perfect and deformed lateral crystalline structures. Punegov, Vasily I.; Kolosov, Sergey I.; Pavlov, Konstantin M. Journal of Applied Crystallography. Aug2016, Vol. 49 Issue 4, p1190-1202. 12p. DOI: 10.1107/S1600576716008396.

Perspective on the use of nanoparticles to improve LIBS analytical performance:

Investigation of characteristics and responses of insulating cement paste specimens with Aer solids using X-ray micro-computed tomography. Chung, Sang-Yeop; Elrahman, Mohamed Abd; Stephan, Dietmar; Kamm, Paul H. Construction & Building Materials. Aug2016, Vol. 118, p204-215. 12p. DOI: 10.1016/j.conbuildmat.2016.04.159.