

March 2011
Volume 11 • Issue 5**In this Issue!**

Materials News

Happenings at MRS

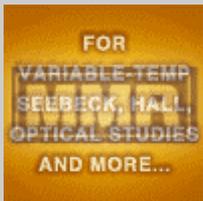
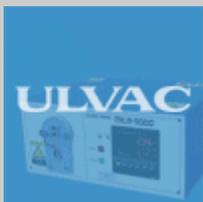
Meetings Update

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Sample Preparation
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Consumables for Electron,
Scanning Probe and
Light Microscopy**IN FOCUS**[2011 Outstanding Young Investigator, Innovations in Materials Characterization Awardees Announced](#)

The 2011 Outstanding Young Investigator award is awarded to Dmitri V. Talapin, University of Chicago "for methodological developments of synthesis and self-assembly of inorganic nanocrystals and for fundamental studies transforming colloidal nanostructures into electronic and optoelectronic materials."

The 2011 Innovations in Materials Characterization Award is awarded to Tye T. Gribb, Thomas F. Kelly, and David J. Larson of CAMECA Instruments "for the highly successful conception, design, fabrication, and commercialization of a three-dimensional local-electrode atom-probe (LEAP) tomograph that enables the determination of chemical information, on an atom-by-atom basis."

SPECIAL NOTE: Nomination deadline for the following prestigious [MRS awards](#) is April 1. Nominate a colleague today!

Von Hippel Award
David Turnbull Lectureship
MRS Medal
Materials Theory Award

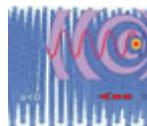
NEWS FROM THE WORLD OF MATERIALS

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[Materials in Focus](#)

[Inverse Doppler shift seen in negative index material](#)

(Physicsworld.com)



The inverse Doppler effect has been observed previously at radio frequencies. A team of researchers has now seen the effect at optical frequencies. To do this the researchers shone an infrared laser beam through a lattice of 2 μm diameter silicon rods attached to a moving platform and recorded the frequency shift of the light leaving the lattice. Being a photonic crystal, the lattice had a characteristic band-gap that forbids the passage of a narrow range of wavelengths, and the researchers say that by tuning the output of their laser so that its wavelength matched the



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edge of the bandgap they were able to negatively refract the laser light. [[Nature Photonics](#)]

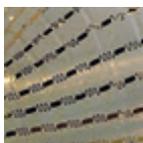
[Controlling electric dipoles to make stable organic transistors](#)

(Nanotechweb.org)

Researchers report a new way to control the electrical characteristics of organic transistors. Modifying the chemical structures of organic semiconductors is challenging, which makes it difficult to control the turn-on voltage of transistors made of these materials. The new work shows that this difficulty can be overcome by controlling electric dipoles in the gate dielectric in these devices. The group used two different types of self-assembled monolayers (SAMs) inside the gate dielectric of their transistors. The first set was made from octadecylphosphonic acid (OPA) and the second from octadecylsilane (OTS). These two commonly used molecules have different "anchor" groups (silane and phosphonic acid) that help them to bind to an oxide surface - a property that allowed the team to generate an electrical potential difference of around 0.35 V between the two SAMs. In nanoelectronics, where a low voltage is generally used, this potential difference is high enough to control the electrical characteristics of the devices using nanoscale dielectrics. [[Nano Letters](#)]

[Materials for multifunctional balloon catheters for medical applications](#)

(Technology Review)



A new surgical tool covered in stretchable sensors could reduce the time required to map electrical problems in the heart from over an hour to just a few minutes. The tool could be one of the first commercial applications for an innovative method for making dense arrays of stretchable, biocompatible electronics using high-performance materials including silicon. The tool, which senses temperature and

electrical activity, could also lead to better monitoring during other types of surgery, potentially reducing the rate of complications. The new catheter is covered in a mesh of hundreds of thousands of high-performance sensors and other electronics. It can be placed in the area of interest and inflated, making hundreds of thousands of contacts at once without the need to move it. When fitted with heating elements, it can also be used to perform ablation—the destruction of the malfunctioning tissue—which normally requires the use of a second catheter. [[Nature Materials](#)]

[Zinc peels back graphene layers](#)

(Nanotechweb)

It is difficult to separate individual layers of graphene from each other because they tend to stick together. Although ordinary sticky tape can be used to strip off several layers at a time, there is still no reliable way to peel off exactly one layer and certainly not in specific patterns for microelectronic device fabrication. Now, a research group may have overcome this problem by sputtering (or coating) selected areas of the top-most graphene layer in a sample with zinc and then applying hydrochloric acid to the surface as a wash. The technique removes the coated areas of graphene while leaving the uncoated areas and the layers below intact. The process can be repeated to produce multiple patterned layers, say the researchers, or even "chequerboard" structures by removing horizontal and vertical layers to create 3D patterns. [[Science](#)]

[Intrinsic inverse spin Hall effect demonstrated](#)

(Physical Review Focus)

It is known that the spin Hall effect is linked to the so-called spin-orbit interaction between an electron's spin and its physical motion. Previous experiments have demonstrated the effect when electrons move through a material in a chaotic fashion, buffeted by frequent collisions. When electrons bounce off obstacles, their spin gives them an additional kick to the right or left--depending on their spin direction. Eight years ago, theorists suggested that subtle details of the spin-orbit interaction might cause a similar sideways drift even in materials through which electrons glide freely, without scattering. Researchers have now attempted to take a snapshot of electron flow on a timescale so short that there could be no scattering. In a sample of gallium arsenide, they first used lasers to create two equal streams of electrons travelling in opposite directions, one stream having clockwise spins (spin down), the other counterclockwise (spin up). Together, these two streams created a pure spin current. This pure spin current should create a small charge current in the sideways direction (sometimes called the "inverse" spin Hall effect) because the two component currents should bend in the same direction. To look for this effect, the team used a second laser to image the sideways charge shift. They found a movement sideways of about 0.1 nanometers that



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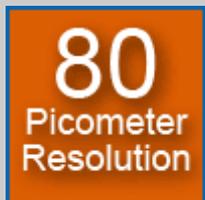
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was evident in a time of only about 0.1 picoseconds. [[Physical Review Letters](#)]

Nano Focus

[Pt nanoparticles in carbon nanotubes form asymmetric catalyst](#)

(Chemistry World)

Researchers have created a new catalyst that could help in the production of chiral molecules for medical drugs. The catalyst, which consists of platinum nanoparticles encapsulated in carbon nanotubes, is the most active of its type ever reported, according to the authors. Although a chiral molecule's two manifestations, known as enantiomers, are often produced in reactions in equal quantities, they can have different properties. In medicine, one enantiomer can be more effective than the other, and researchers are keen to find ways to encourage production of single enantiomers, rather than mixtures. An asymmetric catalyst manipulates a reaction to favour the production of only one enantiomer. The researchers have developed a heterogeneous asymmetric catalyst that could be one of the most effective yet. They submerged carbon nanotubes in an aqueous solution of H₂PtCl₆. Heating and slow drying introduced the platinum into the nanotube channels, and after reduction using sodium formate, the platinum nanoparticles were encapsulated inside the nanotubes. When the team used their catalyst in a standard hydrogenation reaction, they found that 96 per cent of the product was just one enantiomer, produced at a rate or 'turnover frequency' above 1 x 10⁵ per hour, which is superior to that of the well-known Pt/Al₂O₃ catalyst under the same reaction conditions. [[Angewandte Chemie International Edition](#)]

[Microfluidic analyzer detects individual unlabelled nanoparticles](#)

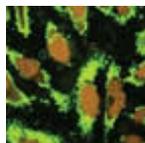
(Eurekalert/University of California - Santa Barbara)

A research team has developed a new instrument capable of detecting individual nanoparticles with diameters as small as a few tens of nanometers. The device detects nanoparticles suspended in fluid as they flow one by one through the instrument at rates estimated to be as high as half a million particles per second. The instrument measures the volume of each nanoparticle, allowing for very rapid and precise size analysis of complex mixtures. Additionally, the researchers showed that the instrument could detect bacterial virus particles, both in saline solution as well as in mouse blood plasma. The researchers further discovered a surprisingly high concentration of nanoparticles present in the native blood plasma. These particles exhibited an intriguing size distribution, with particle concentration increasing as the diameter fell to an order of 30 to 40 nanometers, an as-yet unexplained result. [[Nature Nanotechnology](#)]

Bio Focus

[Nanodiamonds deliver on cancer treatment](#)

(Nature News)



Attaching chemotherapy drugs to nanodiamonds can make the drugs more effective, according to a new study. Nanodiamonds are carbon-based particles 2-8 nm in diameter with a truncated octahedral structure that gives it multiple facets not unlike a diamond's. Anticancer drugs tend to become ineffective because cancer cells quickly pump them out before they have had time to do their work.

This kind of drug resistance accounts for 90% of treatment failure in malignant cancer. Nanodiamonds overcome this problem because the cellular transport proteins that usually pump the drug out of the cell can't carry them. The drug therefore stays inside the cell. The scientists attached the anticancer drug doxorubicin to nanodiamonds. They treated mice with liver tumours with either this compound or with doxorubicin alone, and checked levels of the drug in the tumours two days later. They found that doxorubicin levels were ten times higher in mice treated with the nanodiamond compound compared with mice given doxorubicin alone, and remained high for seven days. The tumors of mice receiving nanodiamond-doxirubicin also shrank more and the mice survived longer. [[Science Translational Medicine](#)]

Energy Focus

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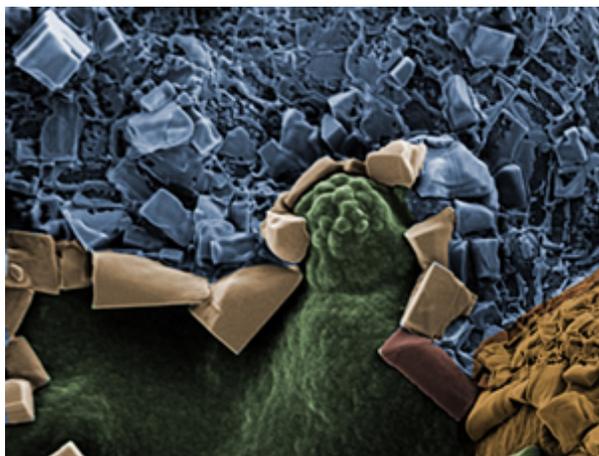
Nothing highlights the modern challenges facing the US electricity grid more than renewable electricity from wind and solar sources. The grid inherits its challenges from an earlier day when its primary function was supplying electricity reliably to every customer who wanted it. The grid did this remarkably well, by bringing power from local generating plants to local customers no more than a few tens of or at most a hundred miles away. There was no concern for carbon emissions in those days, digital quality and uninterrupted power were unknown concepts, and the primary metric was price. With inexpensive coal as fuel and generating plants strategically placed near demand centers, power was delivered at continuously decreasing price from 1890 to about 1970, a singular technological and economic achievement. Renewable electricity changes the game. Renewable electricity cannot always be used locally, especially at midcontinent where wind resources are high or in the southwest US where sunlight is strong. In both cases, population density is low, requiring long distance transmission of renewable electricity over hundreds of miles to find needy customers.

[The Microbes Come Through!](#)

Natural leaking of petroleum occurs all over the World's oceans. Naturally occurring organisms consume this leaking petroleum and they become food for higher organisms, creating a food chain that ends in more fish! Two recent articles in the Guardian (Methane from BP oil spill eaten by Microbes) and the Wall Street Journal (Microbes Mopped Up After Spill) describe how this natural process is confirmed in the Macondo Field oil spill (Deepwater Horizon blowout in the Gulf of Mexico). The articles cite the results of a federally funded published in Science discussing the fact that the hydrocarbon degrading organisms are consuming the hydrocarbons released from the Macondo accident.

Add your comments, or e-mail materialsforenergy@mrs.org to suggest future topics and contributors.

[Image in Focus](#)



Surfacing Turtle

Calcium carbonate crystals mineralized on a chitosan thin film. Image taken in a ZEISS Supra 50VP scanning electron microscope with the secondary electron detector at 6 kV. Sample was coated with Pt/Pd for 30 seconds.

Credit: Philipp M. Hunger, Drexel University, USA

(One of four Science as Art competition second place winners at the 2010 MRS Fall Meeting)

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HAPPENINGS AT MRS

MRS News

The MRS Apprentice Science Reporter Program

This joint program between the Materials Research Society (MRS) and the NSF International Center for Materials Research (ICMR) at the University of California, Santa Barbara funds graduate students/post-docs in materials-related areas at US universities to accompany MRS staff to conferences outside the US and compile daily technical reports for inclusion in the MRS Meeting Scene e-newsletter. For 2011, we are looking for two graduate students or post-docs for covering each of three conferences (total of 6): (1) E-MRS ICAM IUMRS 2011 Spring Meeting in Nice, France, from May 9-13, (2) International Conference on Materials for Advanced Technologies (ICMAT) in Singapore, from June 26 to July 1, (3) XX International Materials Research Congress 2011 in Cancun, Mexico, from August 14-18. The candidates will need to have an interest in science writing, be able to attend talks in materials research areas outside their specific areas of expertise and be able to write up short summaries quickly. They will need to be a graduate student or post-doctoral researcher at a US-based university at the time of the conference. The application by e-mail should include a Resume, writing samples related to materials science/engineering, and a brief letter of intent sent to Dr. Gopal Rao (rao@mrs.org).

materiales extraños

Strange Matter in Mexico



After seven years of touring in the United States and recently in Canada, the MRS traveling museum exhibition, *Strange Matter*, opened in Toluca, Mexico, at the *museo modelo de ciencias e industria (mumci)* in early February. Before introducing the exhibition to the public, a special premier was held for nearly 400 guests. The event highlighted the importance of promoting interest in science among young people in Mexico, and to encourage them to enter a career in science. Present at the event were Lic. Daniel del Río Benítez (Vice-president of Operations of *Grupo Modelo*), Jim DeYoreo (President of the Materials Research Society), Sergio Revah Moiseev (National Prize of the Sciences 2010 in the field of Technology and Design), Marcelo Lozada y Cassou (National Prize of the Sciences 2010 in field of Sciences), Sergio Mejía Rosales (President of the Mexican Association of Materials) and Executive Director of *mumci*, Rocío García Gómez. Also present were Sandra DeVincent Wolf (MRS Director of Membership Development) and Richard A. Souza (Manager, Education and Outreach, MRS).

MRS AWARD NOMINATIONS

Deadline April 1, 2011

[VON HIPPEL AWARD](#)

The Von Hippel Award, the Materials Research Society's highest honor, recognizes those qualities most prized by materials scientists and engineers – brilliance and originality of intellect, combined with vision that transcends the boundaries of conventional scientific disciplines.

[TURNBULL LECTURESHIP](#)

The David Turnbull Lectureship is awarded to recognize the career contribution of a scientist to fundamental understanding of the science of materials through experimental and/or theoretical research. In the spirit of the life work of David Turnbull, writing and lecturing also can be factors in the selection process.

[MRS MEDAL](#)

The MRS Medal recognizes an exceptional achievement in materials research in the past ten years. A Medal will be awarded for a major advance or cluster of closely related advances, in any materials-related field of research. The impact of this research on the progress of the relevant materials field will be a primary consideration in making the award.

[MATERIALS THEORY AWARD](#)

The Materials Theory Award recognizes exceptional advances made by materials theory to the fundamental understanding of the structure and behavior of materials. This Award is intended to honor both those who have pioneered the development of a new theoretical approach and those who have used existing approaches to provide significant new insight into materials behavior.

[Of Interest to the MRS Community](#)

Government Agency Invited Article

(Brought to you by the Government Agency Subcommittee of the MRS Government Affairs Committee) [Transformational Research in Civil Infrastructure and Manufacturing Receives Funding from NIST's Technology Innovation Program \(TIP\)](#)

The [Technology Innovation Program](#) (TIP) within the U.S. Commerce Department's National Institute of Standards and Technology (NIST) recently posted a "Three-Year Plan" outlining the topics of possible future competitions for R&D funding by the program. The research funding roadmap, which looks three years past the current fiscal year, proposes a range of TIP competitions. Proposed TIP competition topics through FY 2014, according to the plan, would include advanced sensing technologies and advanced repair materials for civil infrastructure; advanced materials, biomanufacturing and manufacturing processes and robotics and intelligent automation for manufacturing; technologies to enable a smart grid; technologies for personalized medicine; technologies for water availability; complex networks; and sustainability. The TIP Three-Year Plan is available from [the TIP website](#).

More

[Robert Fleischer \(1930-2011\)](#)

Dr. Robert Fleischer, a pioneering scientist for General Electric at its Niskayuna facility in New York state, an experimenter with the Apollo missions to the moon and most recently a research professor at Union College, has died. He was 80. He is the father of Betsy Fleischer, editor of *MRS Bulletin*.

Fleischer moved to Schenectady, New York, after a stint at the Massachusetts Institute of Technology, where he was an assistant professor of metallurgy, and began a 32-year career at the GE Research & Development Center in 1960. Fleischer was presented with the E.O. Lawrence award for exceptional contributions in research and development in 1971 by the U.S. Department of Energy's Office of Science. In 1972, Fleischer was presented with GE's R&D Center's Coolidge Fellowship Award. After leaving GE in 1991, Fleischer had a brief stint at Rensselaer Polytechnic Institute before becoming a research professor of geology at Union College.

In total, Fleischer published more than 350 scientific papers, held 19 patents, co-authored the book "Nuclear Tracks in Solids," wrote the book, "Tracks to Innovation," and co-edited book sets on intermetallic compounds. His additional awards included the American Nuclear Society's Special

Award for Distinguished Service in the Advancement of Nuclear Science and NASA's Medal for Exceptional Scientific Achievement. He also periodically contributed to the *MRS Bulletin* and was one of the visiting scientists at MRS headquarters in the 1990s.

He is survived by his wife, Barbara, two daughters, Cathy and Elizabeth, and two grandchildren, Daniel and Allison.

MEETINGS UPDATE

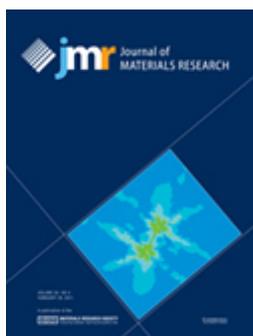
Critical Meeting Deadlines

2011 MRS SPRING MEETING & EXHIBIT April 25-29, 2011, San Francisco, California	Preregistration Deadline—April 8, 2011 Proceedings submission opens March 28
7th International Dendrimer Symposium June 26-July 1, 2011, Gaithersburg, Maryland	Abstract Deadline—March 24, 2011 Early Registration is now Open
E-MRS Spring/ICAM 2011 and Bilateral Energy Conference May 9-13, 2011, Nice, France	Preregistration Deadline—March 31, 2011
Organic Microelectronics & Optoelectronics Workshop VII July 18-20, 2011, San Francisco	Abstract Deadline—March 24, 2011
International Materials Research Congress XX August 14-19, 2011, Cancun, Mexico	Abstract Deadline—May 1, 2011 Preregistration Deadline—July 15, 2011
6th International Conference of the African Materials Research Society December 11-16, 2011, Victoria Falls, Zimbabwe	Abstract Deadline—June 30, 2011
2012 MRS FALL MEETING & EXHIBIT November 26-30, 2012, Boston, Massachusetts	Call for Symposium Proposals Deadline—April 18, 2011

JUST PUBLISHED

Journal of Materials Research

[March 2011, Volume 26, Issue 4 - A selection of papers](#)



[Three-dimensional visualization of dislocation-precipitate interactions in a Al-4Mg-0.3Sc alloy using weak-beam dark-field electron tomography](#)
G.S. Liu and I.M. Robertson. DOI:10.1557/jmr.2010.83

[Hydrothermal BaTiO₃ thin films from nanostructured Ti templates](#)

Hasan Akyıldız, Michelle D. Caspera, Seymen M. Ayygün, Peter G. Lam and Jon P. Maria. DOI:10.1557/jmr.2010.102

Upcoming JMR Focus Issues - Calls for Papers

[January 2012 -- Instrumented Indentation](#)

Manuscript Submission Deadline: May 5, 2011

[February 2012 -- One-Dimensional Micro/Nano Materials](#)

Manuscript Submission Deadline: June 28, 2011

[March 2012 - Plasma and Ion-Beam Assisted Materials Processing](#)

Manuscript Submission Deadline: July 15, 2011

DIVERSIONS

[Did You Know?](#)

that MRS has a presence on [Facebook](#), [LinkedIn](#) and [Twitter](#)?

[Quiz](#)

MRS is organizing joint symposia at which two international conferences outside the US in 2011?
(Answer will be published in the next Materials360®)

Answer to the Quiz in the previous Materials360®:

The first issue of Materials360® was published in November 2001.

[Miscellany](#)

[The Reinvention of Silk](#)

(The New York Times)

Spiders are nature's master silk makers, and over millions of years of evolution have developed silks that could be useful to people – from sticky toothpaste-like mush to strong and stretchy draglines. For years there has been talk of the bright promise of spider silk: that it might one day be used to make cables that are stronger than those of steel, for example, or bulletproof vests that are more effective than those made of Kevlar. There has been a big fly in the ointment, however: spiders cannot spin enough of the stuff. Although a typical spider can produce five types of silk, it does not make much of any of them. Obtaining commercial quantities is a practical impossibility – spiders are loners and require a diet of live insects; some are cannibals. In other words, spider ranching is out of the question.

Researchers have worked to overcome this fundamental limitation by trying to unlock the secrets of the spider's silk-making abilities so silk could be made in the laboratory, or by genetically transferring those abilities to other organisms that could produce silk in quantity. But so far the materials produced lack the full strength, elasticity and other qualities of the real thing. Some scientists are making an end run around the spider problem and working on reinventing the one silk that is plentiful – that of silkworms. They are reconstituting it to make materials that have the potential to go far beyond the dream of bulletproof vests.

[What I Tell My Graduate Students](#)

(Lennard J. Davis, The Chronicle of Higher Education)

In my mind, there is no doubt that an important part of my job is to make sure my graduate students get their own jobs. What that means is talking the turkey of job placement as soon as they walk in my door and tell me they want to do a Ph.D. First I inform them of the current job

situation, whatever that is at the time. I don't sugarcoat the dismal nature, say, of today's academic market. But I also say that I have had very good success in placing my graduate students. Then I make it clear that the first thing they need to do is start thinking about the minimum requirements for going on the job market. They often look a little stunned to be getting a lecture about professional development when they have just come in to ask me if I'll be on their master's-thesis defense. But I think it's not just the early bird who gets the worm; it's the very, very early bird.

NEW PRODUCTS FOCUS

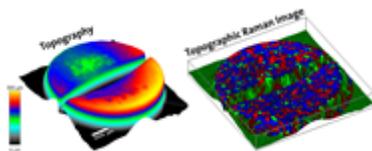
Scientific Graphing and Statistical Analysis Software



Systat Software Inc. recently released SigmaPlot 12, the latest version of their most advanced scientific data analysis and graphing software package. SigmaPlot 12 provides researchers with an enriched user interface, increased ease of use and new features to quickly analyze data and create exact, publication-quality graphs that best present research results for presentation, publication or the web. Unlike other analysis and graphing packages, spreadsheets or business graphing products, SigmaPlot 12 offers complete advisory statistical analysis features along with a full range of graphing templates and utilities for unmatched data accuracy, speed, data analysis and presentation.

[Contact: 800-797-7401 or info-usa@systat.com]

Topographic Confocal Raman Imaging



WITec, a leader in nano-analytical microscopy systems, has launched the new True Surface Microscopy option. The core element of this revolutionary imaging mode is an integrated sensor for optical profilometry. Large-area topographic coordinates from the profilometer measurement can be precisely correlated with the large-area confocal Raman imaging data. This allows for the first time confocal Raman imaging along heavily inclined or very rough samples with the true surface held in constant focus while maintaining the highest confocality. The overall performance and exceptionally accurate imaging capabilities of True Surface Microscopy are beneficial for many applications, including the characterization of micromechanical, medical, or semiconductor devices, the mapping of functionalized surfaces, or the imaging of bio-medical or pharmaceutical material surface properties.

[Contact: 49-731-140-700 or info@witec.de]

[To suggest items for inclusion in Industry News and New Products Focus, please contact [Mary Kaufold](#) at 724-779-2755]

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