

new products

Focus on nanoscience and nanotechnology

The descriptions of the new products listed in this section are based on information supplied to us by the manufacturers. PHYSICS TODAY can assume no responsibility for their accuracy. For more information about a particular product, visit the website at the end of the product description.

Andreas Mandelis

Dual servo system for AFM analysis

Park Systems has released a closed-loop xy scanner with a dual servo system. The instrument loosely decouples the x and y scanners to eliminate crosstalk and adds a symmetrical, low-noise position sensor on each axis to produce accurate and orthogonal (independent) atomic force microscopy. The key technological advance of the company's



new NX10 and NX20 atomic force microscope systems is that the x and y position sensors work in a self-correcting closed-loop system with a separate z position sensor. The x and y position sensors reduce the forward and backward scan gap over a wide bandwidth, which they maintain at less than 0.15%—the best in the industry, according to Park. The dual servo system provides linear and orthogonal feedback control for highly accurate and precise scans for any scan area or sample size. *Park Systems Inc, 3040 Olcott Street, Santa Clara, CA 95054, <http://www.parkafm.com>*

Nondestructive layer-thickness measurements

Oxford Instruments NanoAnalysis has launched LayerProbe, a software tool for the characterization of thin layers on a substrate. An option for the company's AZtec EDS microanalysis system, LayerProbe is claimed to be faster, more economical, and capable of higher resolution than dedicated film measurement tools. LayerProbe analyzes the composition and thickness of a specimen's surface and subsurface layers by x-ray microanalysis of the surface alone. Unlike traditional scanning electron microscope (SEM) thin-film measurements based on specimen cross sectioning, LayerProbe analysis is nondestructive. Geometries only 200 nm wide and layers 2–2000 nm thick can be characterized in seconds. LayerProbe can be fitted to most SEMs and focused ion-beam microscopes. Applications include thickness and composition measurements of metallization and dielectric layers in semiconductors, characterization of the active layers in thin-film solar cells, industrial coating analysis, and various nanoscience research areas such as graphene. *Oxford Instruments, 300 Baker Avenue, Suite 150, Concord, MA 01742, <http://www.oxford-instruments.com>*

Wide-angle x-ray scattering system

Bruker has introduced the N8 Horizon small- and wide-angle x-ray scattering system for materials research applications. Designed for both advanced research and multiuser facilities investigating nanomaterials, including solid bulks, fibers, surfaces, and biological samples, the system is equipped with technologies to achieve high data quality with short measurement time. The μ S microfocus compact x-ray source boosts the x-ray beam's intensity at the sample. The large, 2D VÅNTEC-500 detector, based on the company's propri-

etary MikroGap technology, features quantum-limited sensitivity to detect even weak small-angle x-ray signals. The new SCATEX scatter-free pinholes result in high x-ray beam quality and enable high flux on the sample, which improves signal-to-noise ratio. The N8 Horizon, with its compact vertical design, addresses many multiuser facility



needs, such as ergonomic sample loading, a small footprint, and an integrated camera for quick, easy sample positioning. *Bruker AXS Inc, 5465 East Cheryl Parkway, Madison, WI 53711-5373, <http://www.bruker.com>*

Piezo-positioning-stage digital controller

The digital single-channel controller E-709.CHG from Physik Instrumente provides highly dynamic and nanometer-precise operation of piezo-based stages with high stiffness and electrical capacitance. The positioning systems are mainly used in applications that require high throughput, such as microscopy. The digital technology increases its performance; digital control algorithms optimize the settling behavior and minimize linear deviation. Motion and servo-control parameters can easily be set with software commands. The piezo controller is commanded via universal serial bus, digital serial peripheral, and RS-232 interfaces. In addition, the E-709.CHG is equipped with a high-bandwidth analog interface for target values or sensor signals. The analog output can be configured for the control of external amplifiers or position values. The software package comprises

the user software PIMikroMove and NanoCapture for quick startup and LabVIEW drivers and shared libraries for Windows and Linux. *Physik Instrumente LP, 16 Albert Street, Auburn, MA 01501, <http://www.pi-usa.us>*

Picomotor controller and driver module

New Focus, a Newport Corp brand, has announced model 8742, an open-loop picomotor controller and driver module with four channels. The compact, single-box design provides a solution for driving the company's open-loop picomotor products. The module can be computer controlled with plug-and-play ease via the USB 2.0 and the 10/100 Ethernet interfaces using Newport's motion-control language command set. Model 8742 features picomotor auto-detection technology, an embedded dynamic HTTP server, and connectivity supported by LabVIEW and Windows dynamic-link library. The intuitive graphical user interface Windows application includes a device auto-discovery component. The integrated controller and driver module is offered as a standalone unit or as a four-axis kit that includes all necessary cables and accessories. *Newport Corporation, 1791 Deere Avenue, Irvine, CA 92606, <http://www.newport.com>*



Nanopositioning and probing tools

The introduction of small benchtop scanning electron microscopes (SEMs) has opened up new possibilities for quick, easy imaging of biological and materials specimens. The instruments can produce high-quality images with up to 60 000× magnification. To further enhance the investigative and analytical capabilities of SEMs, Agar Scientific now offers a compatible range of Kleindiek micromanipulation and probing systems. The MM3A micromanipulator can be used in combination with a range of plug-in tips and probes. Up to three micromanipulators can be accommodated in benchtop SEMs for the transport and assembly of microscale objects. Low current measurement, micro gripper, and force measurement

can be added to each MM3A near the specimen stage. The 4-inch-diameter, 10-mm-high prober shuttle uses up to four next-generation MM4 micromanipulators for high-precision *in situ* electrical probing for low current and capacitance measurements. It can also perform standard micromanipulation and pick-and-place tasks. *Agar Scientific, Elektron Technology UK Ltd, Unit 7, M11 Business Link, Parsonage Lane, Stansted, Essex, CM24 8GF, UK, <http://www.agarscientific.com>*

Structural biology research TEM

Designed for structural biologists focused on increasing productivity, the Tecnai Arctica transmission electron microscope (TEM) has been added to FEI's portfolio of structural biology workflows. It incorporates automation first applied to the company's Titan Krios TEM to elucidate the 3D structure of biological macromolecules and molecular complexes. According to FEI, the Tecnai Arctica system's high throughput, ease of use, automated workflow, and economical price lower the overall cost of analysis per structure. Much of the recent progress made in cryo-TEM-based structural analysis can be attributed to the use of a technique known as single particle analysis. It combines images of tens or hundreds of thousands of nominally identical particles to derive a high-resolution, low-noise, 3D model. The particles are first rapidly frozen in physiological solution to preserve their native structure. The Tecnai Arctica is part of an integrated workflow that comprises cryo-sample preparation, data acquisition and analysis, and final visualization to enhance analysis speed and efficiency. *FEI, 5350 Northeast Dawson Creek Drive, Hillsboro, OR 97124, <http://www.fei.com>*

Deposition systems for nanomaterials research

Henniker Scientific has released a new range of deposition systems for nanomaterials research. The family of systems offers the flexibility of several techniques in a single chamber. They provide multi-technique, multi-deposition technology suitable for both small-scale production and R&D prototyping. Each system features a universal "quick-change" source flange that can be configured for

a specific deposition technique or a combination of techniques, including magnetron, thermal, e-beam, and combination sources. In addition to full 360-degree rotation with stage heating and cooling, each system configuration has numerous viewports and equipment ports for ancillary instruments such as ion sources for sample cleaning, thickness monitors, and load-lock entry. *Henniker Scientific Ltd, Unit B3, Trident Business Park, Daten Avenue, Warrington, Cheshire, WA3 6AX, UK, <http://www.henniker-scientific.com>*

Spectroscopic ellipsometer

Horiba Scientific's UVISSEL 2 is a new scientific spectroscopic ellipsometer for nano- and microlayer characterization. It includes a wide range of integrated automated features potentially useful for the investigation of all nanomaterial families. The instrument features a



patented sample vision coupled with automated spot selection to accurately position the measurement spot and region on the sample. To measure very small sample areas, it has an achromatic 35-μm spot size that can cover a large spectral range from the far-UV to the near-IR. Driven by DeltaPsi2 software, the UVISSEL 2 is simple to operate and is capable of characterizing all current materials and next-generation materials and structures. *Horiba Scientific, 3880 Park Avenue, Edison, NJ 08820-3097, <http://www.horiba.com>*

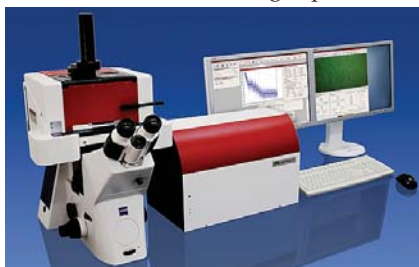
Particle charge analysis method

Izon Science has released the first commercially available method to simultaneously measure the charge and size of nano- and submicron particles on a particle-by-particle basis. The high-resolution analysis feature on Izon's qNano platform is designed for researchers in a range of fields, including

drug delivery, diagnostics, and exosomes and microvesicles. The method measures the electrophoretic mobility of each particle as it traverses Izon's tunable elastic pore. Very fine pressure control, via a new variable pressure module, regulates and optimizes the forces acting on the particles and thus improves the accuracy of zeta-potential measurements. Izon's methodology also allows particle size to be analyzed at the same time, which enables an accurate measurement of both particle charge (zeta potential) and size distribution. As individual particles are measured and counted, the number of particles for each charge and size fraction is also reported. *Izon Science Ltd, 8C Homersham Place, P. O. Box 39168, Burnside, Christchurch, 8053, New Zealand, <http://www.izon.com>*

Optical tweezers system

The NanoTracker2, a new optical tweezers system for quantitative measurements, was recently launched by JPK Instruments. The platform is based on research-grade inverted optical microscopes and designed for sensitive manipulation, force, and tracking experiments.



With the NanoTracker2, users can trap and track particles from several micrometers down to 30 nm and can control, manipulate, and observe samples in real time with nanometer precision and femtonewton resolution. NanoTracker technology provides quantifiable and reproducible measurements of particle-cell interactions. The system delivers precise information about single-molecule mechanics and also can determine mechanical characteristics such as adhesion, elasticity, and stiffness. *Ragona Scientific (JPK Instruments distributor), 1 Wenham Lane, Pittsford, NY 14534, <http://www.jpk.com>*

Protein microrheology system

Malvern Instruments' new dynamic light-scattering system, the Zetasizer

Nano ZSP, delivers enhanced sensitivity and comes with advanced software that drives two new measurement types: protein and microrheological properties. The instrument has the compact size, simplicity, and ease of use of the company's existing Zetasizer Nano systems. The Zetasizer Nano ZSP stands apart, however, in its performance specifications for both size and the measurement of the zeta potential, or electrophoretic mobility, of proteins. That process is simplified by the inclusion in the software of a new protein mobility measurement type that controls data acquisition and guides users through measuring, assessing, and reporting on data quality. *Malvern Instruments Inc, 117 Flanders Road, Westborough, MA 01581-1042, <http://www.malvern.com>*

Nanoparticle analysis and imaging system

Molecular Devices has released the MetaMorph super-resolution system with synchronized image acquisition and processing that enables analysis of object details smaller than 250 nm in fixed and live cells. It features real-time image processing with graphics-processing, unit-accelerated hardware that expands the capabilities of optical microscopy in research. The system supports numerous scientific applications, from time-lapse studies to 3D investigations. When light microscopy is used alone, images of biological matter smaller than 250 nm appear blurred and, as a result, are virtually impossible to analyze. Super-resolution microscopy can help to overcome the limits of light microscopy by reconstructing images at a resolution that surpasses the diffraction limit of the objective lens. With patent-pending image-processing techniques, the MetaMorph super-resolution system is capable of 20-nm lateral resolution in real time. *Molecular Devices LLC, 1311 Orleans Drive, Sunnyvale, CA 94089-1136, <http://www.moleculardevices.com>*

Quantification of nanoscale dimensions

ScatterX⁷⁸ from PANalytical is a compact, ergonomic small- and wide-angle x-ray scattering (SAXS and WAXS) attachment based on patented technology. Its chamber houses modules for the conditioning of the x-ray beam and var-

ious sample holders. The whole chamber is evacuated and thus allows for quick and sensitive SAXS measurements even on weakly scattering and highly dilute samples. With ScatterX⁷⁸, the measurements can be extended to scattering angles up to 78 degrees. The



WAXS signal provides valuable complementary information about a material's atomic order. With PANalytical's PIXcel area detectors, ScatterX⁷⁸ also allows 2D SAXS measurements to be performed, which is important for analyzing anisotropic samples. A versatile technique, SAXS can quantify nanoscale dimensions and analyze nanostructures. It is applicable to virtually all types of nanomaterials, such as liquid nanoparticle dispersions, nanopowders, nanocomposites, and mesoporous materials. The method is also increasingly used to structurally analyze biomacromolecules. *PANalytical Inc, 117 Flanders Road, Westborough, MA 01581, <http://www.panalytical.com>*

Particle-coating system

Picosun Oy has introduced the Picofloat particle-coating system to complement its atomic layer deposition (ALD) equipment and make thin-film coating on powder and particle samples easier to perform. Powder materials form the basis of many industrial products, chemistry and biochemistry catalysts, solid-state batteries, pigments, medical and cosmetic substances, and additives for such items as rubber, paper, plastic, cardboard, and food. With ALD coatings, the particle surface can be tailored according to electrical, optical, physical, or chemical properties. The particles can also be functionalized for new actions. Catalyst manufacturing with ALD is more environmentally friendly than conventional, wet-chemistry-based methods, according to the company. In the Picofloat particle-coating system, the powder to be coated is in constant motion, ensuring uniform ALD film formation on every particle down to nanoscale dimensions. *Picosun USA, 719 Griswold Street, Suite 820, Detroit, MI 48226, <http://www.picosun.com>* ■