

NEW PRODUCTS

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LAWRENCE G. RUBIN

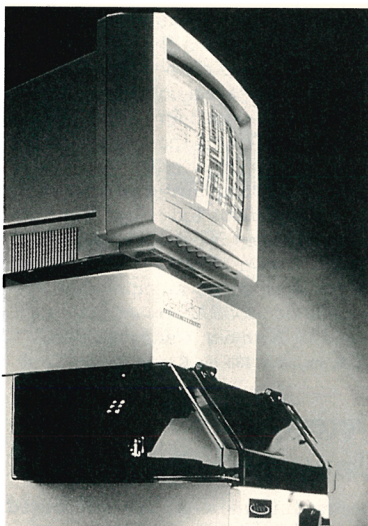
FOCUS ON SEMICONDUCTOR TECHNOLOGY

Imaging Pyrometer

The Mikron M9100 is an imaging pyrometer designed for high-temperature applications in the 500 to 3000 °C range, including heat treatment and induction furnaces, electron beam melting, and research in semiconductor processes such as chemical vapor deposition. The M9100's 776 × 484-pixel array detector unit produces a high-resolution image that is not obscured by "blooming," a side effect of the intense energy emitted from very hot, bright target areas.

A number of interchangeable lens assemblies are available, including one that allows measurement of a 20 µm diameter at a distance of 10 cm. The M9100's narrow band spectral response in the near infrared region minimizes errors due to variations in target emissivity. Because the windows and viewing ports are made from materials such as quartz, Pyrex, and sapphire, there is minimal attenuation of infrared energy at the pyrometer's operating wavelength. The company's image processing software allows data manipulation. *Mikron, 16 Thornton Road, Oakland, New Jersey 07436*

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XY sample positioner and zoom optics.

All three models include a color video microscope for viewing the sample surface. All scans are referenced to an optical flat to provide a stable baseline for measuring waviness, flatness, and curvature. *Veeco Metrology Group, 112 Robin Hill Road, Santa Barbara, California 93117*

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Surface Profilers

The Veeco Metrology Group has announced the DEKTAK 3 series of stylus-based surface profilers for measuring step heights, roughness, and planarity in microelectronic applications. Step height repeatability of 10 angstroms (1 sigma) enables profiling of surface features on semiconductor wafers, micromachined devices, hybrid circuits, and the measurement of the thickness of thin films and coatings. Three models are available: the DEKTAK 3 for samples up to 12.5 cm in diameter and a maximum scan length of 30 mm; the 3 ST for samples up to 15 cm in diameter and a maximum scan length of 50 mm; and the 3 ST AUTO I, which includes a motorized

Spectroscopic Ellipsometer

The J. A. Woollam Co has developed the 157-SE spectroscopic ellipsometer for measurements at wavelengths of 146 to 190 nm (8.5 to 6.5 eV), at the higher wavelength end of the vacuum ultraviolet range, where air is highly absorbing. We are told that previous commercial ellipsometers have been limited to the spectral range above 190 nm. With the 157-SE, the microlithography industry will be able to obtain accurate optical constants at the 157 nm lithography line, which is being proposed as the next step beyond 193 nm. The instrument should provide increased sensitivity for studying ultrathin films and short-wave-

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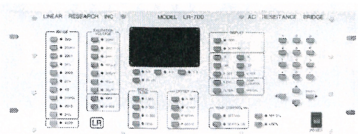
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length optical properties. *J. A. Woolam Co, Inc, 645 M Street, Suite 102, Lincoln, Nebraska 68508*

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Emission Microscope

Hypervision's PTF1, a lightweight emission microscope, pinpoints the sites of chip-level functional failures immediately after the existence of a failure has been revealed by automatic test equipment. Working either in the insertion mode for test heads or in the look-down mode for packaged devices, the PTF1 makes an emission image of the failure site in around 10 minutes. A key to its speed is the zoom optical system. One lens change allows 0.8 to 1500 \times magnification with push-button resolution. Designed for use on the test floor, the PTF1 is portable, with a boom-mounted microscope on a rolling stand. Articulated arms adapt to any test head without fixturing. The company's Windows NT-based image processing software allows real-time image filtering and image manipulation. *Hypervision Inc, 46560 Fremont Boulevard, Suite 415, Fremont, California 94538*

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Detector for Unwanted Photoresist

Spectra International has introduced the RESIST-TORR, an *in situ* sensor that detects unwanted photoresist in the wafer degas stations of plasma vapor deposition (PVD) systems. RESIST-TORR can be fully integrated into a PVD cluster tool used in semiconductor fabrication, process tool manufacture, and other thin-film applications. When used with the company's process monitoring software, the sensor detects detrimental levels of residual photoresist and will interrupt the processing of any wafer that enters a vacuum processing system. The tool is then



stopped automatically, so that the wafer can be removed from the system. *Spectra International, 380 Woodview Avenue, Morgan Hill, California 95037*

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Sputtering System

The ARC 2000 series of magnetron sputtering systems from TORR International has been designed for use in manufacturing semiconductor sensors, micromachined devices, fuel cells, and microanalysis equipment. The systems feature a multispeed turbomolecular pump-mechanical pump combination, which can handle 20 mTorr pressure of argon gas during sputtering, and a multiple stand-alone gun bellows mounted for precise angular adjustments. Also included are a bellow-driven rotary substrate holder that is thermally and electrically isolated, a heating capability of up to 900 $^{\circ}\text{C}$, with associated thermal shields and a disc heater driven by a controller fed from a thermocouple on the substrate; a thickness monitor; and shutters for the guns. A water-cooled stainless steel chamber, available in diameters of 12, 16, or 18 inches, has multiple viewports and a sample loading door. *TORR International Inc, 12 Columbus Street, New Windsor, New York 12553*

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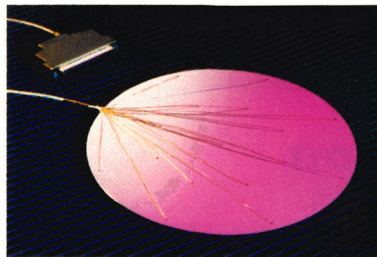
System for Plasma Characterization

Hidden Analytical has announced the series 1000 EQP, designed for the characterization of plasma processes. The EQP system combines a triple-filter, quadrupole mass spectrometer with a 45 $^{\circ}$ sector field energy analyzer, an integral residual gas analyzer ionizer, and a wide dynamic range pulse-counting detector. It features a mass range of up to 3000 atomic mass units and energy range options to 1000 eV. Standard configurations include magnetically shielded systems for operation in magnetically confined plasma and extended probe versions for translation across large plasma reactor chambers. The systems can be supplied with a powered sampling electrode for *in situ* plasma studies and an electron ionization attachment for detailed studies of electronegative reaction products. Hidden's Windows-based MASsoft software allows automatic measurement, real-time display, and storage of the mass and energy spectra. *Hidden Analytical Ltd, 420 Europa Boulevard, Warrington WA5 5UN, England*

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Wafer Temperature Measurement

SensArray has introduced the Process Probe 1730, an instrumented wafer with an array of embedded thermocouples for directly measuring the temperature and temperature uniformity of wafers in photoresist track systems, vapor prime systems, bake ovens, and spin-on glass systems. Coupled with the company's data acquisition and analysis tools, the 1730 can characterize in real time each step of a process



cycle: load, temperature ramp, steady state, cooldown, and unload. The wafer measures a wide temperature range, from -150 to 300 °C, with a thermocouple-to-thermocouple precision of better than 0.1 °C. Available in diameters of 50 to 300 mm with up to 34 Type-K thermocouples, the wafers can be used repeatedly to calibrate temperature set points, optimize system dynamic response, and establish wafer thermal models for model-based control systems. *SensArray Corp, 3410 Garrett Drive, Santa Clara, California 95054*

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Ellipsometry for Thick Films

Rudolph Technologies has developed a metrology approach for measuring the thickness and uniformity of very thick transparent films (5 to 50 μm). While traditional ellipsometry is an effective technique for measuring very thin films (a few hundred angstroms or less), multiple-angle-of-incidence ellipsometry enables the measurement of the thick polyimide and resist films used in the semiconductor industry. The latter technique is exploited in Rudolph's Multi-Domain Production Ellipsometry system.

Just as thick films exhibit distinct oscillations in spectral reflectance (reflectance versus wavelength), they also cause oscillations in certain ellipsometric parameters as a function of incidence angle. The system accurately determines the film thickness by measuring the oscillation period and the refractive index of the film at the meas-

urement wavelength. *Rudolph Technologies Inc, One Rudolph Road, P.O. Box 1000, Flanders, New Jersey 07836*

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Turbomolecular Pumps

The ATH 1300M Maglev Turbopump from Alcatel is designed for the high-pressure and high-throughput pumping requirements of 0.18 μm geometry semiconductor etching processes. It handles corrosive gases and achieves high reliability through the combination of five active axes, automatic balancing system, heating device (in the MT version), inverted seal, and inert gas purge. The magnetic levitated bearing in the five active axes allows the rotor to rotate without any contact, wear, lubrication, noise, or vibration, we are told. The ATH 1300M can pump nitrogen gas at a speed of 1250 l/s at inlet pressures up to 0.1 Pa; at higher pressures, the throughput can be increased by decreasing the pump's rotational speed.

In case of power failure, the pump's motor acts like a generator to supply electrical power, enabling the levitated rotor to slow down gradually, without the need for a battery. *Alcatel Vacuum Products Inc, 67 Sharp Street, Hingham, Massachusetts 02043*

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New Literature

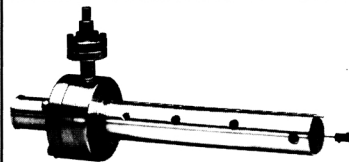
The latest edition of Lake Shore Cryotronics's *Temperature and Control* catalog features information on the company's cryogenic temperature sensors, temperature controllers and monitors, current sources, and temperature transmitters and accessories. The reference section includes a comparison of available sensor types and outlines installation techniques for low-temperature measurements. *Lake Shore Cryotronics Inc, 575 McCorkle Boulevard, Westerville, Ohio 43082*

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Leybold Inficon's 1999/2000 instrumentation catalog (on CD-ROM) includes information on the company's *in situ* analyzers and sensors for semiconductor and thin film processes; helium and halogen leak detectors; vacuum gauges for total pressure measurement; and vacuum components for system construction. A vacuum technology reference section provides fundamentals, formulas, and tables. *Leybold Inficon Inc, Two Technology Place, East Syracuse, New York 13057*

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