

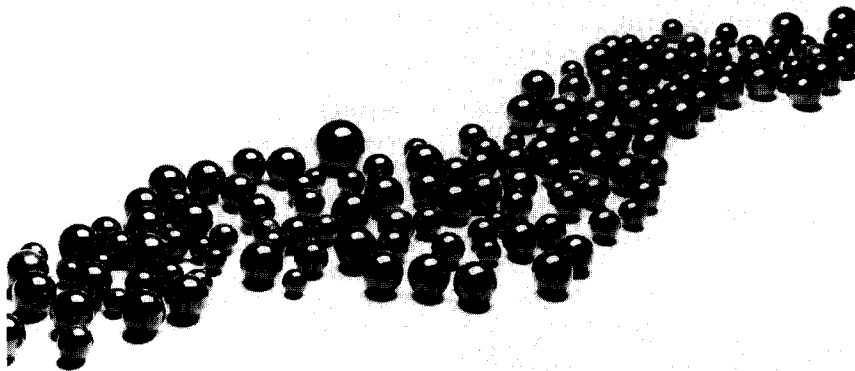
## MATERIALS/PRODUCTS

**Ceradyne, Inc.**, Costa Mesa, California, has introduced a new line of NeedleloK™ ultra-tough silicon nitride balls for use in control and shutoff valves and lightweight high-performance bearings. The Ceralloy® 147-3 silicon nitride precision balls will *perform with or without lubricant at low and high temperatures and in corrosive and erosive environments* related to the chemical, automotive, machine tool, and defense industries. They will operate effi-

ciently at temperatures that would actually melt steel components and are non-magnetic and electrically resistive. The unique microstructure of Ceralloy® 147-3 reveals an elongated grain growth, giving NeedleloK™ silicon nitride greater wear resistance and the ability to withstand rolling contact fatigue.

Circle (3)

*A powerful magnetic chuck that works independent of any outside electrical energy*



Ceradyne, Inc.

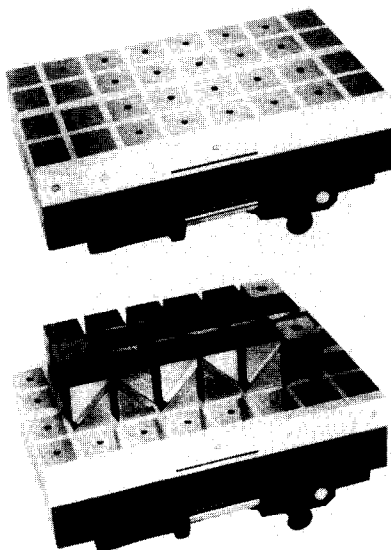
*supply* has been developed by the French firm **Brailon**. The model PFD is an excellent workholding tool for machine tooling lines that use palettes and milling machines and is particularly well suited for chip removal operations. An independent permanent magnetic chuck that carries its own energy source, the power of the PFD is "unleashed" by simply turning a lever 180°. A safety lock ensures that the holding power will stay engaged during heavy machining operations. Nd-Fe-B magnetic plates combined with a unique checkerboard pole configuration provide the PFD chuck with an unequal holding force of 500 psi.

Circle (4)

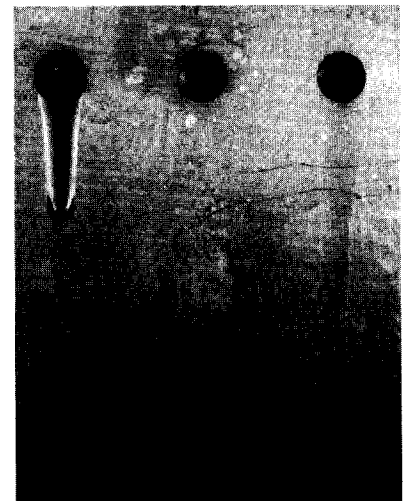
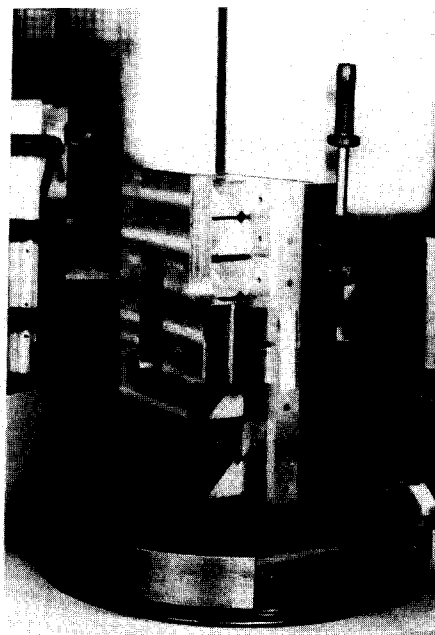
*A new grade of elemental amorphous boron powder* termed SB 99 and rated at 99% boron content has been introduced exclusively by **SB Boron Corp.**, Franklin Park, Illinois. It is the purest amorphous boron powder available anywhere. Among its specifications, SB 99 is said to contain less than 50 ppm metallic contamination and to have an average particle size of 620 Å.

Circle (5)

*A long-lasting corrosion-preventive metal surface coating*, Castrol TARP, that features thixotropic properties is available from **Castrol Industrial, Inc.**, Chicago, Il-



Brailon



Castrol TARP (middle) quickly sets up compared to other coatings (right & left) that drip and run.  
Castrol Industrial, Inc.

linois. As a thixotropic gel, this material has a semisolid, grease-like consistency at rest, but when agitated, it liquefies. When the agitation stops, it remains liquid for a short time and then sets up again as a semisolid, nondrip, nonsticky gel. It offers covered or indoor protection for up to 5 years or more and is equally effective in humid, salt-laden, or acidic atmospheres. Circle (6)

**Enthone-OMI, Inc.**, Warren, Michigan, recently introduced UBAC<sup>®</sup> EP Bright Acid Copper. It produces a **brilliant, ductile copper deposit with excellent leveling characteristics**, used primarily as an undercoat in a variety of nickel/chromium plating combinations on steel, brass, aluminum, zinc-base die castings, and plastic. Excellent brightness and leveling are obtained over the entire current density range, especially in low current density areas. The material also features a higher tolerance to impurities and high temperatures than conventional acid coppers. Circle (7)

A full line of **ceramic coatings that are applied like ordinary housepaint** for protecting metals, ceramics, and graphites from high-temperature attack by atmospheres, molten metals, salts, glasses, plastics, slags, fluxes, and most any corrosive material is now available from **ZYP Coatings, Inc.**, Oak Ridge, Tennessee. The coatings are usable to over 3500 °F (1900 °C) for most uses and all are nontoxic, water-base, and easy-to-use like ordinary housepaint, with simple brush-on and air-dry techniques. All are inorganic and safe to the environment. Circle (8)

**Precision Thin Metals(LP)**, Beaver Dam, Wisconsin, has announced that its develop-

ment program for producing **thin-gage, high-tolerance copper foil** has been a success. The copper foil is the latest addition to the company product line, which already includes foils of low-carbon steel, high-carbon steel, and most grades of stainless steel. Foil development continues with high-temperature nickel-base superalloys, titanium, and molybdenum. The high-quality, high-precision, thin metal and alloy foils are produced by the peeling process, which bypasses the expensive hot and cold rolling operations used in conventional processes. Circle (9)

Injection moldable and extrudable grades of Stat-Kon<sup>®</sup> PDX-S, the **first conductive thermoplastic composite to combine stainless steel fibers with nylon**, is now offered by **LNP Engineering Plastics**, Exton, Pennsylvania. The unique combination guarantees the conductivity of stainless steel with the durability and processing benefits of a thermoplastic. By providing conductivity, corrosion resistance, and significant weight savings, the new grades offer the great potential cost savings demanded by the automotive, medical, and industrial markets. Circle (10)

**A flux for brazing plumbing fixtures, musical instruments, HVAC equipment**, and numerous other applications is now available from **The Superior Flux & Mfg. Co.**, Cleveland, Ohio. Superior No. 600B is a black flux that is active and protective in the temperature range of 1050 to 1600 °F (565 to 870 °C). It promotes excellent wetting of the filler metals on the base materials, resulting in strong braze joints. Best results are obtained using silver alloy filler metals and brass base materials. Chipping and

grinding are not required with No. 600B, because flux residues are water soluble and can be completely removed with hot water. Circle (11)

A material recently synthesized by scientists at **TNO Institute of Geoscience**, Delft, The Netherlands, is a **soluble, intrinsically conducting polymer** that could greatly simplify the manufacture of conducting patterns for printed circuit boards. The conventional process by which such patterns are made is rather time consuming, because it requires substantial amounts of copper to be removed by etching. However, the new soluble conducting polymer developed by TNO can be spin-coated onto substrates and subsequently cured by applying spatially selective radiation. The insoluble conductive polymer that is formed after exposure to the radiation remains on the pattern substrate, whereas the uncured soluble material can simply be washed off. Circle (12)

**UGIMAG, Inc.**, Valparaiso, Indiana, announces that it has increased manufacturing capability for UGISTAB magnets, now available in a wide range of dimensions and geometrical shapes for advanced motor designs, including blocks and arc segments. The improved material offers **better resistance to demagnetization fields caused by armature reaction**. The Nd-Fe-B magnets are unique because they are capable of operating at temperatures of 356 °F (180 °C) with high corrosion resistance. They have a greater coercivity, which enables them to provide increased thermal stability of magnetic characteristics. Circle (13)

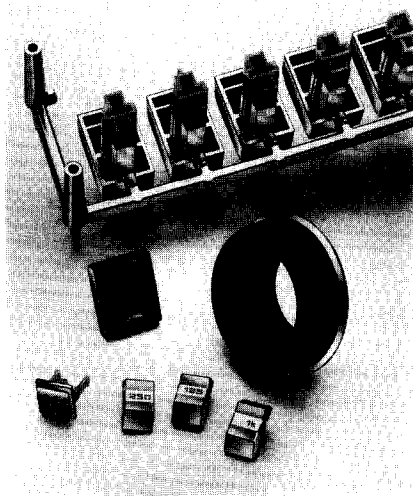
## PROCESSING/EQUIPMENT

**Polymer Research Corp. of America**, Brooklyn, New York, is offering its unique specialized services to the industry with the development of a chemical grafting technology that enables the **attachment of desirable properties of an existing material without changing the material itself**. By selection of specific chemicals and using the propriety graft initiator of the new method, several permanent properties can be added to existing products, including corrosion resistance, lubricity, abrasion/scratch/wear resistance, moisture/vapor barrier, chemical resistance, bactericidal/fungicidal properties, conductivity, increased adhesion, ozone resistance, non-flammability, etc. The chemical grafting

process is equally adaptable to glass and textile materials. Circle (14)

The first **high-production hydroforming machine, using internal liquid pressure** expanding outward against external dies to form multiconvolutions simultaneously, has been developed and produced by **AMH**, Camarillo, California. There are many advantages to this process, including the fact that use of stretching and cutting machines are not required to size lengths and swaging machines are not needed to reduce the tube after stretching and cutting. Test results indicate consistent and uniform wall thickness and less material work hardening after forming. Circle (15)

An advanced coating process—electron beam-physical vapor deposition (EB-PVD)—depositing a thin, uniform, highly homogeneous coating on any metal or ceramic surface at a highly efficient rate, could significantly **reduce the cost of manufacturing composites**. The coating technology and innovative approaches and equipment was developed at the E.O. Paton Welding Institute, Kiev, Russia. Efforts to purchase equipment in the United States, from the Ukrainian group, is being spearheaded by the **Center of Excellence for Composites Manufacturing Technology (CECMT)**, Kenosha, Wisconsin, which is managed by the Great Lakes Composites Consortium, Inc. Circle (16)



Taiyo Technology of America

A unique process for *selectively electroplating patterns or legends on ABS/resin-molded components* is available from **Taiyo Technology of America**, Arlington Heights, Illinois. The process provides numerous opportunities to the designer for new graphic and decorative approaches. In addition, in many cases, product cost is substantially reduced, because the process eliminates costly masking procedures or two-piece designs. The process provides flexibility for the design engineer where plating is desired under nonshorting or non-grounding conditions. Conversely, it can permit the addition of a conductive path for grounding. The technique also can be used to produce a textured metal surface on a textured plastic molded part. Circle (17)

**Battelle Laboratories**, Columbus, Ohio, in cooperation with Ferranti Sciaky, Chicago, Illinois, has produced an automated, computer-controlled precision welding system for the *repair of jet engine turbine and compressor blades*. The system will greatly reduce the cost and time required to replace or repair the blades. With the Battelle-designed computer software program, combined with a Sciaky AcuWeld™, up to 30 blades per hour can be repaired with improved quality and consistency, thus reducing the cost of repair. Circle (18)

The first extended production of Thixomolded™ parts by **Lindberg Corporation**, Rosemont, Illinois, has confirmed that this revolutionary net-shape process has high yields and productivity. A total of 14,800 commercial magnesium parts were produced during a 1-week period. The yield of parts shipped was 86% of the feed material input. The process is carried out in a unit-

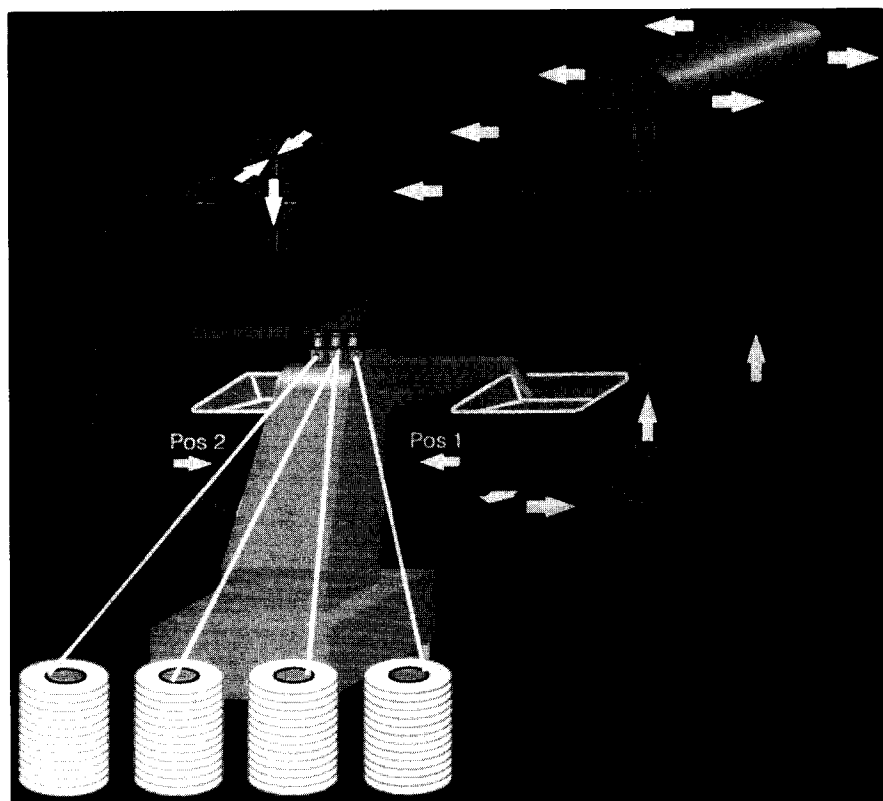
ized machine combining aspects of die casting and injection molding and *eliminates all molten metal handling, melt losses, and related disposal issues*. No debinding or sintering is needed. The Thixomolding™ process addresses the timely issues of recyclability, safety, energy conservation, and environmental responsibility, while simultaneously producing higher quality parts than conventional high-pressure die casting. Fifteen successful prototype runs in magnesium have been completed successfully. Circle (19)

To meet the increased demand by industrial producers for a *preformed product that has greater structural stability*, **Owens-Corning**, Toledo, Ohio, has developed the Programmable Powdered Preform Process (P-4). The process is a robotized preforming system that allows greater design freedom by providing good control of positioning and orientation of the fibers. It was developed to overcome drawbacks of previous processes such as slow cycle time, manual spray-up, difficult demolding, and waste and energy consumption. The preformer consists of a robot with several glass delivery systems, an air ducting and heating system, and a mold carrier with preformed screen. Three glass delivery systems send fiber through a nozzle, which is then

sprayed on the screen to specified locations and thicknesses. The technology gives users many options for design and allows a wide range of glass or fiber contents to be achieved. One of its best features is that preforms can be obtained with net shape and virtually no waste. Circle (20)

**Porter International**, Louisville, Kentucky, announces the introduction of Intersleek® Foul Release Coating Systems. This new technology is a *nontoxic system that provides long-term fouling control*. No toxins or biocides normally found in foul control coatings are present. Over a properly prepared and primed substrate, the advanced silicone polymer coating technology provides a low-energy surface, to which fouling has extreme difficulty attaching. Wave action and currents create a self-cleaning effect and any loosely adhered fouling simply falls off under its own weight. Circle (21)

A new breakthrough in the field of *micromachining through the use of a laser beam* has been achieved by **Advanced Recording Technologies**, Escondido, California. The new laser system, Laserlith, has cut rings from a piece of ferrite—used in electronics for its magnetic properties—that are small enough to loop over the hairs on a housefly's head. Tiny objects are easily pro-



Owens-Corning



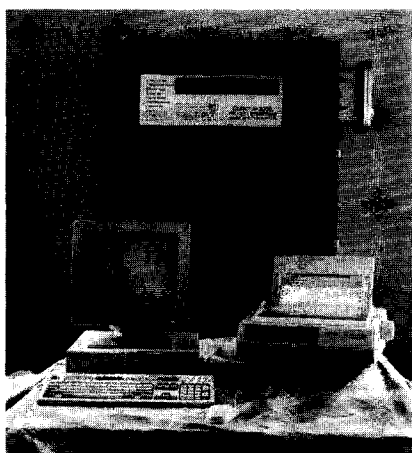
Advanced Recording Technologies

duced from a variety of ceramics and metals. The laser beam can be manipulated to a size that is so fine that readable characters no higher than one fifth the diameter of a human hair can be scrolled out like newspaper print. The Laserlith can be programmed to identify where to machine, move to that position, perform the cutting task, and then measure what was accomplished. The accuracy attained is measured in a few millionths of an inch. Circle (22)

For years, scientists have been studying spiderwebs and have identified seven different types of threads created by arachnids. Because of its high elasticity and high energy absorbency, spider dragline silk is now being proposed as a possible reinforcing fiber in composites, to be used in the automobile and aerospace industries.

## TESTING/MEASUREMENT/EVALUATION

EnviroSpec 3000, an *on-line quadrupole mass spectrometer for industrial environmental gas monitoring*, has been introduced by **Asea Brown Boveri (ABB) Process Analytics**, Lewisburg, West Virginia. The 3000 has the capability of monitoring up to 32 gases or vaporized liquids per sample stream in up to 64 sample

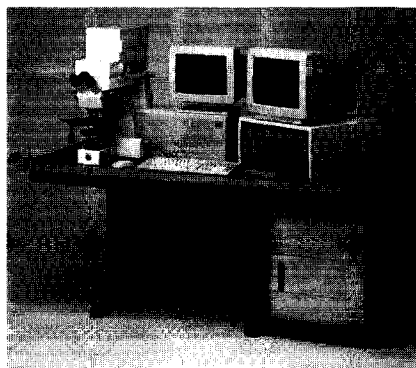


Asea Brown Boveri (ABB) Process Analytics

streams. It is the first microprocessor-based spectrometer designed specifically for on-line industrial application. The unit provides fast, accurate, highly specific analysis of gas and vapors from ppm to 100% concentrations. Complete analysis typically requires only 10 to 20 s per stream on a single instrument. Circle (23)

**Carl Zeiss**, Thornwood, New York, has introduced a new version of its Confocal Laser Scan Microscope, the LSM 3, for materials and microelectronics applications. Retaining all the features and functions of the previous version, the LSM 3 *breaks new ground in speed image processing, power, and ease of use*. The system controller has been redesigned, increasing

the image processing and analysis speed. It is based on a 80486/33 MHz microproces-

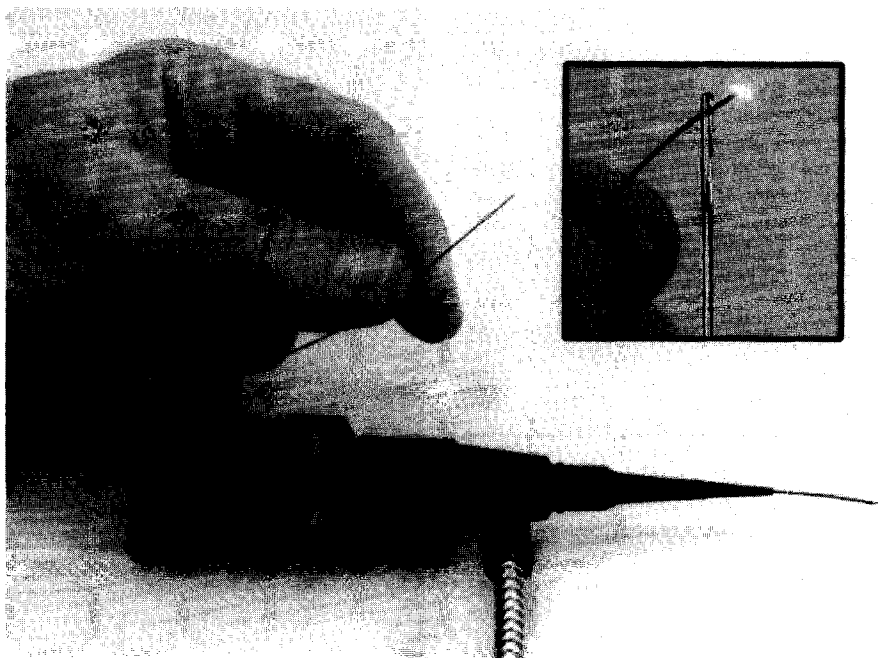


Carl Zeiss

sor and uses Matrox image processing boards for increased power and speed. The application software is written in Windows 3.1 and gives the user full control of all system functions with easy-to-use icons and selections. The system can perform high-resolution three-dimensional imaging and optical profiling as well as OBIC techniques, emission microscopy, and infrared imaging, thus providing a powerful tool for failure analysis and process control. It is also an optical metrology tool in materials research; surface roughness, layer thickness measurements, and topographical imaging are some of the capabilities of the system.

Circle (24)

A fiberscope so small that it can be threaded through the eye of a needle has been announced by **Olympus Corp.**, Industrial Fi-



Olympus Corp.

beroptics Div., Lake Success, New York. The Ultra Thin Model IF6PD4 has a waterproof insertion tube with a maximum outer diameter of 0.64 mm (0.025 in). This **miniature size opens up many new applications for remote visual inspection** ranging from precision dies and castings for the aerospace, automotive, and plastics industries to electronic components and small instruments and valves. In spite of its tiny size, the new scope has the ability to illuminate a working area with light from a standard Olympus light source and return a bright, sharp image to the inspector's eye or to a videocamera attached to the scope industrial eyepiece. Circle (25)

**Loctite Corp.**, Newington, Connecticut, has opened a new "Customer Engineering Center" in the San Diego, California, area to help designers and manufacturers in the Southwest resolve fastening, sealing, bonding, and coating applications. The Center pioneers the use of an advanced High Resolution Image Transfer System, allowing customer parts to be **examined simultaneously at both the San Diego and Newington locations**. Specialized equipment and services available through the San Diego Center can handle every type of adhesive- and sealant-related study, including surface analysis, thermal analysis, environmental, mechanical and physical testing, research chemistry, environmental health and safety issues, quality engineering, and equipment service. Loctite's satellite laboratories in San Diego, Cleveland, Detroit, Mississauga, Canada, and Mexico City will eventually be linked to networks in automotive, industrial, and aerospace plants, which will add real-time visuals to the intellectual

integration already achieved. A similar communications network has been implemented by Loctite in Europe, Asia, Australia, and South America. Circle (26)

The new "MiniPhasec," **phase plane eddy current instrument** from **Hocking**, Lewistown, Pennsylvania, can be used for surface crack detection of aircraft structures, bearings, welds, and automotive components in the field or plant. The 6-lb package can easily be carried to the job site, and its compact profile permits testing in tight, restricted places. It operates on standard alkaline or NiCad batteries or AC power. Circle (27)

The new MC4120 series Multi-Cool bath from FTS Systems, Inc., Stone Ridge, New York, provides a 4-liter liquid bath capable of **achieving fluid temperatures down to -120 °C** using liquid nitrogen as the cooling source. The bath can be ordered with a built-in rack suitable for cooling up to 72 Charpy impact test specimens. Other applications include thermal shock testing and cooling of exothermic reactions. A recirculating pump is available to circulate the bath fluid through an external site. Circle (28)

The Sonic 136 **microprocessor-controlled small-scale portable ultrasonic test instrument** offered by **Stavely Instruments, Inc.**, Kennewick, Washington, combines a wide selection of parameter controls with an easy-to-use menu display for the detection of flaws or thickness measurement in various materials. Features built in for easy operation include a square wave pulser receiver with five tuned settings, for enhanced near-surface resolution and optimized transducer performance. Test results are

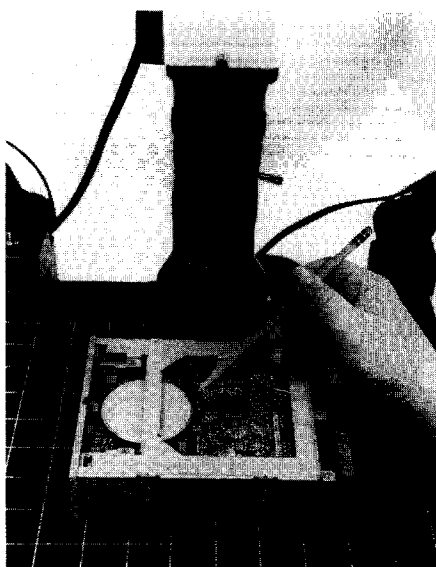
stored with sharp resolution and sensitivity by the waveform digitization circuit, which allows for later recall. Circle (29)

The new Model 3110 Atomic Absorption Spectrometer from **Perkin-Elmer Corp.**, Norwalk, Connecticut, combines cost effectiveness, analytical power, operational simplicity, flexibility, and reliability for AA analyses—all in a single system. As a system designed to grow with changing analytical requirements, it represents a **major evolutionary advance in AA instrumentation**. Optimized for flame, mercury/hydride, and graphite furnace sampling techniques, the 3110 features a high-dispersion monochromator for maximum light throughput and improved performance. Its quartz-coated reflecting optics provide durability and high energy efficiency over the entire AA range, from arsenic to cesium and features programmed parameter entry for simplified use with all sampling techniques. Circle (30)

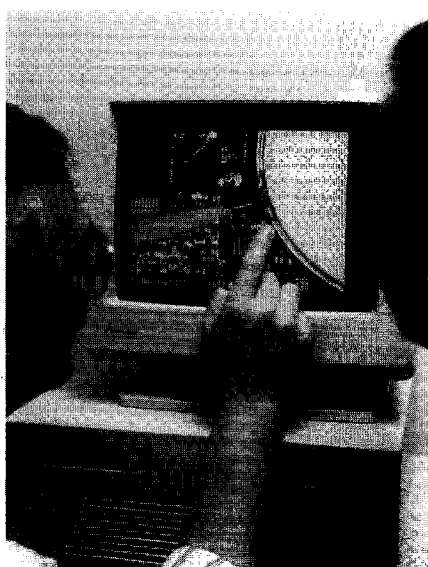
**Atlas Electric Devices Co.**, Chicago, Illinois, has announced the availability of the CONE2 Combustion Analysis System, a sophisticated system designed to **provide important fire hazard data for materials testing**. Properties determined by the CONE2 include peak and average heat release rates, total heat release, effective heat of combustion, specific extinction area, exhaust flow rate, mass loss rate, final sample mass, time to sustained ignition, soot mass production, and Co/Co<sub>2</sub>. The advanced features and technology of oxygen consumption calorimetry of the Atlas CONE2 make it the principle fire testing instrument of the future in determining and formulating newer and safer materials. Circle (31)

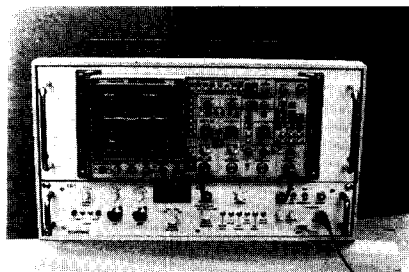
A new Microwave Dielectric Analyzer from **KDC Technology**, Acton, Massachusetts, **measures curing of thermoset and thermoplastic polymers and composites noninvasively**. A microwave sensor determines true dielectric constant change with track curing, an advancement over lower frequency conductance methods. The MDA-1000 has patented sensors that can be flush mounted in a mold, pipe, or other container for continuous on-line or batch control. The sensors need not be embedded in the material under test. Other applications include nondestructive testing of nonconductive composites, ceramics, and materials, mixture and emulsion ratio measurement, moisture measurement, and material anisotropy measurement. Circle (32)

**Magnetic Analysis Corp.**, Mount Vernon, New York, has announced the development of an ultrasonic thickness gauge to provide **cost-effective, highly accurate thickness**



Loctite





Magnetic Analysis Corp.

**measurement** in factory or laboratory environments. Using a pulse-echo technique similar to sonar to determine thickness, the TG-1 is designed for use in both on-line applications that require continuous thickness gauging of plastics, metals, or other materials and off-line applications that necessitate continuous or point-by-point measurements. Its adjustable parameter controls make the unit well suited for laboratory applications requiring an adaptable thickness instrument with a high degree of adjustment capability. Circle (33)

GasVue Model TG-5, a **new tracer gas imaging system** recently introduced by **Infra-metrics, Inc.**, Billerica, Massachusetts, allows users to detect and image pressure leaks in production line applications. Gas

leaks as small as  $0.016 \text{ std cm}^3/\text{min}$  ( $50 \text{ g/yr}$ ) can be located. The system greatly improves on time-consuming and costly methods of production line leak detection, such as dip tanks, soaping, or pressure decay. It can be used up to a distance of 5 m (15 ft) for detection and location of leaks. The tracer gas system is used primarily for production line leak testing where the integrity of leaktight products, such as fuel tanks, pumps, and heat exchangers must be tested.

Circle (34)

**Seiko Instruments**, Torrance, California, has introduced the DMS120, an instrument for **measuring mechanical properties of specimens**. This new dynamic mechanical analyzer offers TA researchers dynamic loading of up to 1000-g force, permitting laboratory analyses of stiff, thick materials such as carbon fiber-reinforced composites or "dog-bone" plastic test samples. The unit has a very low spring constant, allowing quantitative characterization of samples that exhibit a significant change in mechanical properties at the glass transition stage. Versatility of the system is demonstrated in its ability to operate in both the bending and shear modes of deformation and to accommodate a wide range of stiffnesses and geometries in samples.

Circle (35)

**Advanced ultrasound technology to measure very thin composite raw materials** (prepregs) during manufacturing has been demonstrated by **XXsys Technologies**, San Diego, California. The Ultrasonic Resin Analyzer (URA) eliminates conventional, destructive testing, which uses hazardous chemicals and cannot be performed on-line. The computerized technology is more precise, faster, and less expensive than existing chemical methods for analyzing composite materials. Circle (36)

The new Perthometer S3P surface-measuring instrument is now available from **Mahr Corp.**, Cincinnati, Ohio. The S3P **brings lab-type surface measurement capability with "Class 1" accuracy to the shop floor** for machine tool or production line operators. It measures surface roughness of metals, plastics, and most other solid materials, automatically evaluating all common parameters, including the R(K) family, amplitude density curve, bearing ratio curve, and RZ (per DIN and ISO). Designed for use by casual operators, the S3P can be programmed to perform up to six different routines with a single keystroke and provide simple accept/reject readings based on specified tolerances. It can also do statistical evaluation of up to eight parameters over 80 measurements. Circle (37)

## LITERATURE/DATA SOURCES

**Rofin-Sinar**, Plymouth, Michigan, has produced a new, six-page brochure that provides concise technical information, operational features, and specifications for its advanced RS-800I series of **high-power, transverse flow CO<sub>2</sub> industrial material processing lasers**. The brochure presents the key elements of the series—which has been enhanced for reliability—in performance features that ensure optimum beam quality and in control functions for ease of operation. Circle (38)

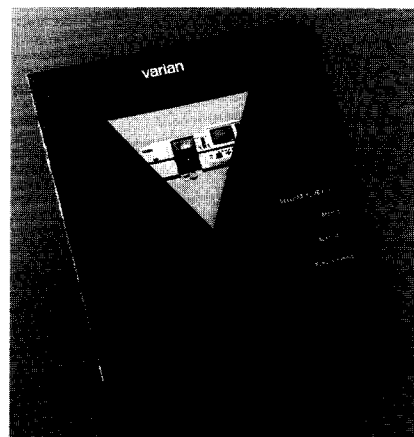
The **U.S. National Institute of Standards and Technology (NIST)**, Gaithersburg, Maryland, has collaborated with the **National Research Institute for Metals (NRIM)**, Japan, to develop a **computerized database of evaluated materials properties for high-temperature superconductors**. The database will include materials specification and characterization information, such as processing details, material form, and crystallography, electrical, thermal, mechanical, and chemical properties, resistance or resistivity, surface resistance at microwave frequencies, Hall coefficients, magnetic susceptibility, specific heat, ther-

mal conductivity, thermal diffusivity, thermal expansion, elastic properties, flexural and tensile strengths, Weibull modulus, hardness, fracture toughness, Debye temperature, Gruneisen parameter, and corrosion properties. It is being developed for use on personal computers and will feature a menu-guided interface. Circle (39)

**Varian Associates, Inc.**, Palo Alto, California, offers a 21-page brochure describing the SpectrAA-10/20 **Plus atomic absorption (AA) spectrometers and accessories**. The bulletin lists the system configuration and specifications, describes the optics and flame atomization systems, details standard and optional software, and highlights a family of accessories for flame, vapor generation, and graphite furnace AA. Circle (40)

An easy-to-use reference work that helps **locate government documents, maps, patents specifications, standards, and other defense-related resources** and provides information on how to acquire them is available from the **U.S. National Technical Information Service**, Springfield, Virginia. "How to Get It: A Guide to Defense-

Related Information Sources" describes each item and gives its source, acronym, series designation or short title, cost, where it is indexed, and telephone numbers to call for additional information. It emphasizes research, development, testing, and evaluation programs. Circle (41)



Varian Associates, Inc.

A two-page product bulletin provides detailed specifications and ordering information on the most affordably priced **pressure transducer for extrusion processing of Industrial Sensors, Inc.** A copy is free from the Winchester, Massachusetts company. Circle (42)

"Rheology of Acrylic-Modified Polypropylene for Thermoforming," a presentation recently delivered by C. Cruz, Jr., **Rohm and Haas Co.**, Modifiers Research Dept., has been made available by the Philadelphia, Pennsylvania company. Because only a narrow window of temperatures can be used when thermoforming polypropylene parts, the paper focuses on **polypropylene (PP) melt rheology as it affects thick gauge, cut-sheet thermoforming**. It profiles the sag process and its rheological aspects and the performance of an R & H modifier to improve the thermoformability of PP. Circle (43)

A new software program written to be of assistance to anyone needing to **calculate the volume and area of geometric shapes** is available from **Dyna Prise, Inc.**, St. Paul, Minnesota. CVA (Calculate Volume and Area) draws the shape for the user as a cross-check for recognition. Developed primarily for manufacturers producing custom plastic and metal parts, it eliminates the possibility of math errors in complicated formulas, is mouse-driven for point-and-click ease, and comes with a database of over 400 plastics and metals, along with their specific gravities for calculating part weight. Circle (44)

**Ciba Composites**, Anaheim, California, offers a four-page technical data sheet on Aeroweb<sup>®</sup> HMX-20, a **high-strength, commercial aramid honeycomb** that is well suited for marine, ground transportation, and other industrial applications. Made of high-temperature resistant Nomex<sup>®</sup> paper, the material was developed for use as a core material for high-performance industrial composite sandwich structures. The two-color data sheet provides basic product description and application information, as well as extensive data on physical, mechanical, and related properties. Circle (45)

"Resist Chlorides, Retain Strength and Ductility with Duplex Stainless Steel Alloys," a new six-page brochure from the **Nickel Development Institute**, Rocky Hill, New Jersey, is now available. It is the latest in a series of publications from NDI covering a wide range of applications and properties including fabrication of nickel-containing materials. Circle (46)

A state-of-the-art computer program, MOCHA<sup>™</sup> Image Analysis Software for Windows<sup>™</sup>, from **Jandel Scientific**, San Rafael, California, **turns images into meaningful data precisely, reproducibly, and automatically**. MOCHA can be used to quantify intensities and morphometries of cells, particles, fibers, materials, autoradiograms, and other applications where images are routinely measured. Circle (47)

**CAD/CAM Publishing**, San Diego, California, announces the publication of the **Rapid Prototyping Directory**. It lists rapid prototyping service bureaus, equipment manufacturers, vendors of specialty software for rapid prototyping, suppliers of rapid prototyping materials, and CAD software that produces output suitable for rapid prototyping. It is the most comprehensive directory of its kind. Circle (48)

A videotape **training lecture on neutron radiography** is offered by **Industrial Quality, Inc.**, Gaithersburg, Maryland. The 45-min. tape, complete with a lesson guide, takes the viewer through the principles, methods, standards, and applications of neutron radiography as a recognized method for nondestructive testing. It provides an excellent background for users or potential users of neutron radiographic inspection, as described by a recognized expert in the field. Circle (49)

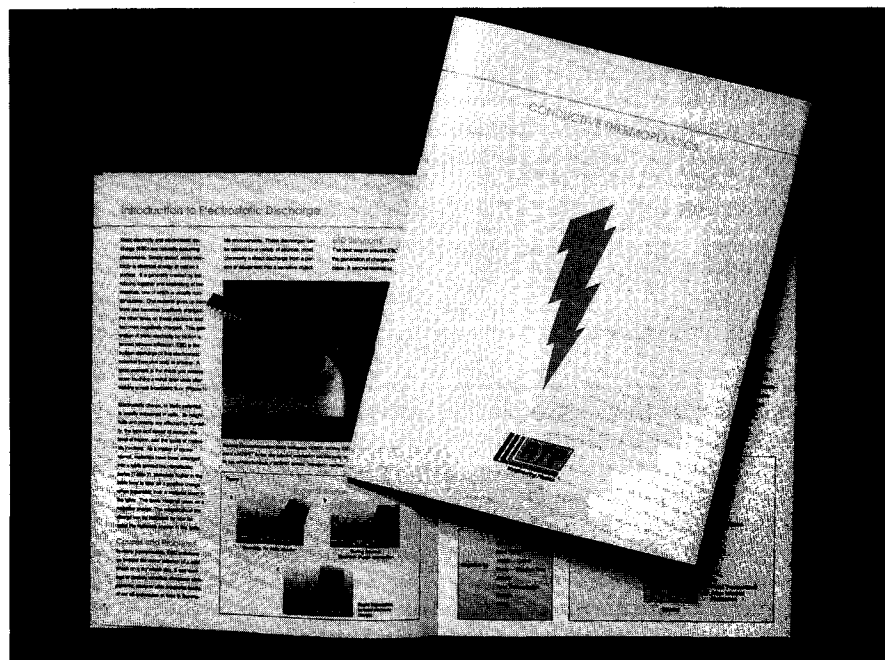
A 12-page, four-color brochure from **RTP Co.**, Winona, Minnesota, includes a tutorial, application examples, and a **guide to**

**the company's conductive compounds**. A sheet-extruded sample of Permatstat<sup>™</sup> permanently antistatic ABS conductive thermoplastic is included. Circle (50)

The **Proceedings of the Seventh International Cadmium Conference**, held in New Orleans, Louisiana, in April 1992, is now available from **The Cadmium Council, Inc.**, Reston, Virginia. The work contains the full texts of over 40 papers and the general discussions in over 200 pages. It constitutes an authoritative record and review of all aspects of the use of cadmium, cadmium in health and the environment, and the international cadmium regulatory scene. Circle (51)

To **facilitate the teaching of powder metal-lurgy (PM) at academic establishments**, the **European Powder Metallurgy Association (EPMA)**, Shrewsbury, Shropshire, England, has produced a nine-part lecture series on PM, in English, complete with 154 quality slides. Its objective is to guide the user through the various stages of the PM process. Topics include introduction, manufacture/properties of metal powders, forming of powders, sintering, secondary operations, mechanical properties, applications, economics, injection molding, etc. Circle (52)

**Cortest Laboratories, Inc.**, Houston, Texas, is pleased to announce that it has initiated a **Corrosion Problem Solver Toll-Free Telephone Service: 1-800-352-2CLI**. Companies needing assistance can obtain quick access to Cortest specialists



RTP Co.



who have years of technical expertise in corrosion control and materials selection. A free copy of the Cortest Corrosion Problem Solver Software is also available by request on the Problem Solver Toll-Free Service line.

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**"Damage Detection in Composite Materials"** is now available from the **American Society for Testing and Materials (ASTM)**, Philadelphia, Pennsylvania. The volume contains two sections: Advanced Imaging and Measurement Techniques and Manufacturing and Service-Induced Damage. It is intended for composite material users, particularly stress analysts, design engineers, structural engineers, inspection (NDE) engineers, and also researchers at universities and government laboratories.

Circle (53)

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The **Powder Metallurgy Equipment Association (PMEA)**, Princeton, New Jersey, has published a 150-page directory containing catalogs of *major suppliers of equipment used to manufacture powder metallurgy (PM) parts and products* and products made from particulate materials. Technical information is provided on compacting presses, tools and dies, sintering

furnaces and belts, atmosphere gases, and impregnation and metal grinding equipment. A list of Association members is also included.

Circle (54)

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A technical brochure entitled **"The Influence of Manufacturing Technology on the Effectiveness of Nickel Diffusion Barriers for High Temperature (100 to 200 °C) Dry Circuit Applications,"** is now available from **Technical Materials, Inc.**, Lincoln, Rhode Island. The nine-page bulletin has particular relevance to design professionals interested in electrical/electronic connectors, where environmental stress is a concern. Nickel diffusion barriers produced by both electroplating and clad metal technologies are compared. Guidelines for estimating material system performance based on anticipated thermal exposure are noted.

Circle (55)

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The **Proceedings of the Sixth Japan-U.S. Conference on Composite Materials**, offered by **Technomic Publishing Co., Inc.**, Lancaster, Pennsylvania, contains over 70 in-depth reports from the June, 1992 event. Topics are closely related to the practical needs of industrial materials engineering. The book presents papers on advanced

composites including high-temperature, ceramic, metal, elastomeric, and thermoplastic matrix composites, as well as carbon-carbon composites, and includes stress analysis, test methods, interfaces and materials systems, smart structures, ceramic matrix composites, durability, prediction/ observation, ceramic/metal matrix composites, micromechanics, structural design analysis, design/optimization, strength analysis, and data bases.

Circle (56)

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The **1993 PM Buyers' Guide** from **Metal Powder Industries Federation**, Princeton, New Jersey, lists manufacturers of powder metallurgy parts and products. The 96-page directory provides information on production capabilities of 82 manufacturers of PM products made from stainless steel, copper, brass, bronze, aluminum, titanium, nickel, tool steel, superalloys, and tungsten metal powders. A list of members of the Powder Metallurgy Parts Association, Metal Powder Technology Association, and Metal Injection Molding Association is included. Information on manufacturing equipment, in-house secondary and quality control capabilities, materials, and specialty products are provided for each company.

Circle (57)

## INTERNATIONAL RESEARCH/MANUFACTURING CENTERS

Preliminary tests of a *new biocompatible alloy of zirconium, palladium, and ruthenium* show that the material has extraordinary resistance to fracture and wear. The patent is held by the **American Dental Association Health Foundation**, sponsor of the Paffenbarger Research Center at the U.S. National Institute of Standards and Technology (NIST), Gaithersburg, Maryland. The alloy is strong enough for dental and medical devices and holds significant potential as an industrial coating where high-performance materials are required

for bearing surfaces and mechanical joints. The material has proven strongly resistant to wear and corrosion.

Circle (58)

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Researchers at **Argonne National Laboratory**, Argonne, Illinois, have developed a *new system to analyze the composition of thin films*, which can be used to make computer chips and superconducting devices, as they are "grown" one layer of atoms at a time. Using the new system, they can use X-rays to determine if any flaws are being incorporated in the layering. Each of the

elements in the compounds produces a different characteristic light pattern when struck by an X-ray, providing information on the composition of the layer. The combination deposition and analysis system monitors the composition of the thin film as it is growing. The system can also provide information to computers controlling manufacturing processes so that they can make needed adjustments during deposition.

Circle (59)

## UNIVERSITY VIEW

Using a microwave processing technique with molds to form final shapes, researchers at **Northwestern University**, Evanston, Illinois, have devised a new way to *make parts of ceramic composites from the inside out*, making them stronger and much faster to manufacture. These new fiber-reinforced ceramic composites, made with aluminum oxide or silicon carbide, can withstand much higher temperatures than metal and can be used to make high-temperature valves or other engine parts,

even in complex shapes. Using this new method of microwave-assisted chemical vapor infiltration, a 1/2-in. thick ceramic can be prepared in less than a day.

Circle (60)

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A new technology now under development at the **University of Southern California**, Los Angeles, California, promises computer printouts in the form of fully molded and finished three-dimensional objects. A number of investigators nationwide have been working to invent a "net form" metal-

working process that can create *completely finished, ready-to-use objects from raw stock*. The USC group has patented a new process that uses a nozzle to dispense a precision stream of molten metal droplets. These build up the parts, drop by drop, into precisely the shapes desired. Successive layers of metal are applied so that the arriving drops of molten material fuse completely with their still-soft predecessors. The head designed for the three-dimensional part-making system breaks up a fluid



column of molten metal flowing through a vacuum into a stream of extremely uniform droplets, each about 0.004 in. in diameter, which can be directed with great precision. Pieces can then be constructed to tolerances of approximately two ten-thousandths of an inch—about ten times the precision called for in the specifications of car parts like pistons or cylinders. Circle (61)

A method of assembling "buckyballs" into neat layers, like crates of oranges, has been developed at **Northwestern University**, Evanston, Illinois. Such stacking is believed to be the first step toward constructing new materials with the soccer ball-shaped hollow carbon spheres. It is a means of rationally *organizing buckyballs into two- and three-dimensional structures* and involves the use of a "guest" molecule

that holds the first layer of buckyballs to a surface and subsequent guest molecules that bind the layers of fullerenes together. The experiments mark the first time that buckyballs have been chemically attached to a surface and assembled in more than one layer. Circle (62)

## KUDOS

**Paul J. Becker**, Technical Supervisor, **Climax Research Services**, Farmington Hills, Michigan, has been awarded the ASM Metallurgical Assistant's Award. Becker was presented the Award in February by the ASM Detroit Chapter for his development of new testing equipment and new methods for the evaluation of a variety of materials and for his involvement in training many materials engineering assistants.

**Lindberg Corporation** President, **Stephen E. Speltz**, has been elected 1993 President of the Industrial Heating Equipment Association. Prior to joining Lindberg in 1982, Speltz was President of Warren/Dielectric Communications, formerly a unit of General Signal.

The American Association for the Advancement of Science has elected **Stan A. David**, Group Leader/Materials Joining, Metals/Ceramics Div., **Oak Ridge National Laboratory**, Oak Ridge, Tennessee, to the rank of Fellow.

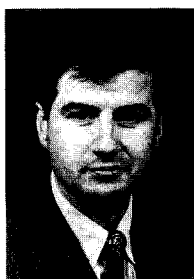
For his contributions to ion beam and plasma processing of thin-film materials, **Jerome B. Cohen**, Dean of Engineering and Applied Science, **Northwestern University**, Evanston, Illinois, has been elected to membership in the U.S. National Academy of Engineering. Also named to the Academy was **Robert L. Fleischer**, staff member, **GE Corporate Research and Development Center**, Schenectady, New York, for his work in the development and diverse applications

of high-temperature materials, solid solution hardening, and etched particle track detectors.

**Charlie Faust**, a former 24-year **Battelle Laboratories**, Columbus, Ohio, researcher prior to retirement in 1971, has been selected for induction into the Ohio Science, Technology, and Industry Hall of Fame. Faust, whose name appears on 140 patents, is recognized for his significant contribution to the process of electropolishing, specifically producing a mirror-like finish on stainless steel surfaces without using mechanical operations, such as grinding, polishing, or buffing.

The new Director of Engineering position at **Tocco, Inc.**, Boaz, Alabama, has been filled by **Ronald R. Akers**. Akers will be responsible for all of Tocco's engineering, quality assurance, and testing activities. He was previously located at the company's Sales, Service, and Technology Center in Madison Heights, Michigan.

In addition to continuing as Vice President, Technology, at the **Howmet-Cermet Casting** facility, Montreal, Quebec, Canada, **Steven F. Kennerknecht**, has been named general manager of that operation. He will be responsible for directing all engineer-



S.F. Kennerknecht

ing, manufacturing, and accounting functions. He joined Howmet-Cermet in 1980.

The **Titanium Development Association**, Boulder, Colorado, has elected **Michael Suisman** as President. He is Chairman and CEO of Suisman Titanium Corp., Hartford, Connecticut. Suisman has written a number of articles on aerospace metal recycling, notably on titanium for which he has been awarded the Philadelphia Metals Association Phoenix Award for "Achievement in Titanium Recycling." In addition, he edits *Titanium News*.

**Richard D. Smith**, formerly associated with Outokumpu/American Brass, Kenosha, Wisconsin, has been named Director of Technical Service—a new position—at **Ampco Metals, Inc.**, Milwaukee, Wisconsin. He has responsibility for the Company's chemical, spectrographic, and mechanical labs.



Thomas J. Nichol

**Rolled Alloys, Inc.**, Temperance, Michigan, has named **Thomas J. Nichol** as President. He joined the Company in 1981 and was most recently Vice-President, and General Manager, since 1987.

**How Many? 50.** Number of acres of Earth's rain forest lost **each minute**.

The Electric Power Research Institute (EPRI), Palo Alto, California, recently completed a prototype microwave clothes dryer. It not only dries the clothes faster, but saves more than 20% of the electricity used by conventional dryers and is less damaging to wools and other sensitive fabrics. The lower temperatures required to heat the clothes in the microwave dryer result in less shrinkage and wear on clothing. According to EPRI Senior Project Manager, John Kesselring, "Researchers have been striving successfully for decades to reduce the time spent on domestic chores." The next development in domestic time-savers—hoped-for by homemakers the world over, but not confirmed as yet by EPRI—is a robot to fold that microwave-dried laundry.