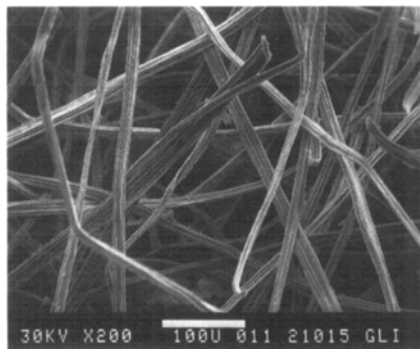


## MATERIALS/PRODUCTS

**Cookson Magnets**, London, England, has presented its new Bremag 10N rare earth bonded magnet. The neodymium-iron-boron (NdFeB) magnet, with magnetic values of 10 MGOe opens up a new realm of design possibilities to engineers. The high magnetic values and reduced density make the magnets *ideal for miniaturization where weight is a concern*, as in small, high-performance motors. With off-tool tolerances of  $\pm 0.1$  mm, good mechanical strength and good surface finish capabilities, the magnets are available in disks, rings, blocks, and segments. They can be pressure bonded to a variety of shapes and sizes, and being isotropic, can be magnetized in any direction to meet a variety of application needs. Circle (4)

*Higher performance, with lower loading concentration, can be obtained with very fine nickel fiber* from **Ribtec**, Micrometal Fiber Div., Gahanna, Ohio. Fiber has the ideal geometry for producing a conductive network in a non-conductive matrix, such as paint, plastic, adhesive,



Ribtec

gasket, and fabric materials. The smaller the diameter, the more fiber length per pound; therefore, less weight is required. A 2-micron nickel fiber has a length of over 10,000 miles per pound, the highest of any nickel product now available. Nickel's low resistance allows for the formation of a highly conductive network for shielding effectiveness that can exceed 90 dB in the 30 to 1000 MHz range. Circle (5)

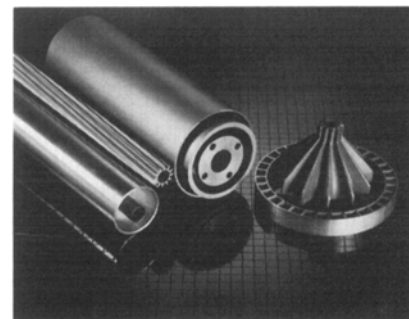
A new high-temperature alloy, **Nicrofer® 6025 HT-alloy 602 CA** (2.4633),



Krupp VDM GmbH

has been developed by **Krupp VDM GmbH**, Werdohl, Germany. Containing 60% nickel and 25% chromium, this material displays *excellent corrosion resistance and creep strength* up to temperatures of 1,200 °C (carbide hardening) and outstanding resistance to oxidation and carburization (Al<sub>2</sub>O<sub>3</sub> formers). It is far superior to other high-temperature and heat-resistance nickel-base alloys. Applications are found in industrial furnaces in the auto industry, chemical process technology, and power generating equipment, where improved high-temperature corrosion behavior and increased component life is required. The new material can be TIG welded without difficulty in thicknesses up to 6 mm without undergoing hardening and displaying good mechanical properties. It can also be formed by conventional methods for other nickel-base alloys. Circle (6)

Ultralight seamless beryllium tubing which can be extruded in a wide range of structural shapes and supplied complete with aluminum, titanium, or beryllium end fittings, ready for final assembly, are available from **Nuclear Metals, Inc.**, Concord, Massachusetts. The tubing features a modulus of 44 million psi and a density of 0.067 lb/in.<sup>3</sup>, making it the *optimum material for use in structures which require light weight and*



Nuclear Metals, Inc.

*good stiffness* to support payloads. It can be extruded as angles, T-shapes, I-beams, rectangular tubing and rods. An effective heat sink, beryllium has an 11.6 Micro-in./in./°C. Other characteristics include 100-200 Kpsi tensile strength and 5.5-7.5% elongation. Circle (7)

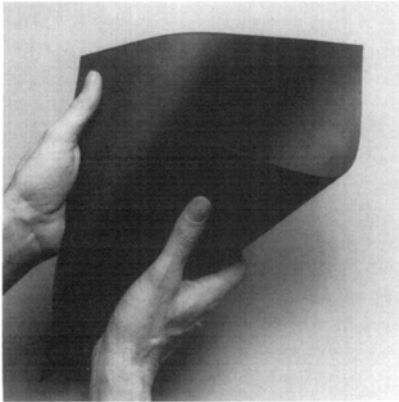
**Desilube Technology, Inc.**, Lansdale, Pennsylvania, has discovered a new formulation of graphite which *increases the serviceable temperature by about 200 °C over conventional marketplace graphite*. **DESILUBE 121** was developed as a lubricant to perform over a wide temperature range for seals, gaskets, lining, brakes, heat exchangers, molds, coatings, and other industrial mechanical parts. It can be used under thermal conditions up to 1600 °F (870 °C) in air and more than 1000 °C in vacuum, inert gas, or reducing atmospheres. Where pure graphite begins to oxidize below 700 °C and loses 100% of its mass by 850 °C during thermal analysis, **DESILUBE 121** still retains 75 percent of its mass at 1,000 °C in air. Circle (8)

**Textron Specialty Materials**, Lowell, Massachusetts, has announced the establishment of next-generation ceramic matrix composites by developing *silicon carbide reinforcing fibers with the ability to perform at higher temperatures and strength* than ever before. By using expertise in producing SiC fiber by the chemical vapor deposition (CVD) method, the company aims to further improve fiber properties and reduce fiber diameter to increase flexibility for weaving and bending into complex shapes. The new experimental fibers have increased

temperature capability—over 2500 °F—improved creep strength, and will bend around a much smaller radius. Circle (9)

Sermatec TDC (transmission and distribution coating) a water-based inorganic zinc coating designed for utility and industrial applications on structures such as transmission towers, has been introduced by **Sermatech International**, Limerick, Pennsylvania. It *improves upon existing zinc coating technology* in ease of application, pot life, and material quality. The coating will accept a wide range of topcoats, including epoxies, silicones, and urethanes, and is designed to provide extremely long life to structures. Circle (10)

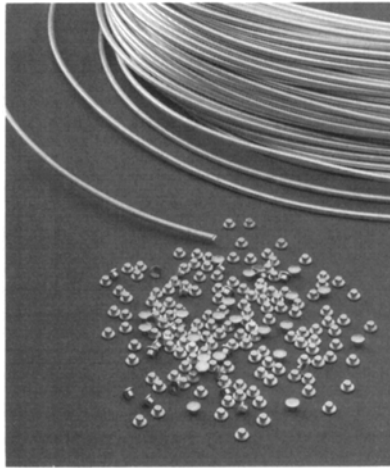
**USM TEXON**, Russell, Massachusetts, announces the introduction of Valutex, an **SBR binder-reinforced paper designed for high-speed laminations to substrates** such as vinyl, fabric, leather, foil, and



USM TEXON

films. It can be used as a filler or stiffener, laminated to other papers, films or foils to produce higher edge tear resistance, while maintaining excellent flexibility. It can also be extrusion laminated with polyethylene. The paper die cuts cleanly without chipping and accepts both water-based and hot-melt glue. Circle (11)

Chromium nitride (CrN) coating introduced by **Balzars Tool Coating Inc.**, North Tonawanda, New York, was developed to *provide performance characteristics superior to titanium metal coatings* in specific applications. The coating resists adhesive wear, corrosion, and oxidation. It is recommended for coating tools used to machine titanium and copper, and tools and dies used in high temperature die casting, semi-hot forging of brass, and glass fabrication. It is harder than conventional chromium plating. The application process has no negative environmental effect. Circle (12)



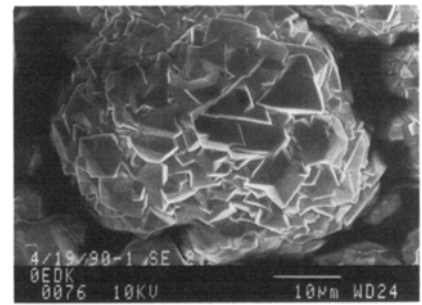
Handy and Harman

An ecologically safe material system offering superior formability, increased ductility, and enhanced erosion/corrosion characteristics in electrical contact applications is now available from **Handy and Harman**, Industrial Production Div., Fairfield, Connecticut. The newly developed silver-tin oxide material is *an effective alternative to silver cadmium oxide*. Produced by advanced manufacturing techniques, the material system is easy to work with, reduces tool wear, and has excellent current-carrying capabilities. It also is ecologically safe, since it substitutes tin oxide for the cadmium traditionally used in silver contact alloys. The new material is capable of carrying a higher current per volume of material than silver-cadmium oxide. Circle (13)

Scientists at **Lockheed Missiles & Space Co., Inc.**, Palo Alto, California, are *turning swamp gas—a mixture of hydrogen and methane—into diamonds*. Hydrogen and methane are pumped into a small reactor, the substrate is introduced, and then the gases are irradiated with microwave energy. A thin film of diamonds are produced on the



Balzars Tool Coating Inc.



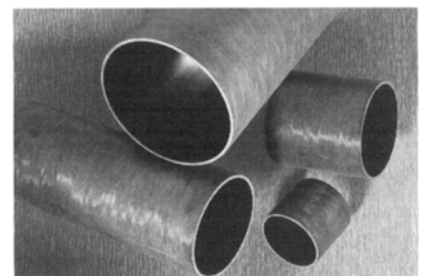
Lockheed Missiles & Space Co., Inc.

substrate. Because they are only about one millionth of a meter across, they can only be seen by a scanning electron microscope. Potential uses for the tiny gems are in diamond films for infrared windows in heat-seeking missiles, bearing surfaces, and thermal management for advanced computer chips. Circle (14)

Fine particle silicone, a *new spherical form of silicone resin*, has been introduced by **GE Silicones**, Waterford, New York, for use as an anti-blocking agent for plastic thin films. The SR340-346 series of silicone particles decreases the contact area between film layers to prevent them from sticking together. These unique particles surpass conventional anti-blocking agents, such as silica, in improved film clarity, performance, and consistency of particle size. They also deliver excellent value through higher product yield. Circle (15)

**LNP Engineering Plastics**, Exton, Pennsylvania, has developed *four new grades of EMI-X® nickel-coated graphite reinforced shielding compounds* for use in housings and bezels for electronic devices and electronic business machines. The nickel-coated fibers offer advantages in mechanical property performance such as higher strength and stiffness than do composites based on stainless steel fibers. Circle (16)

**Black-Amalgon®** filament-wound fiberglass tubing, available from **Amalga Composites, Inc.**, Milwaukee, Wisconsin, is



Amalga Composites, Inc.

designed to be a **light-weight, high-strength, cost-effective alternative** to metal hydraulic and pneumatic cylinder barrel materials. Constructed of glass fiber, reinforced, epoxy-resin with an ultra-smooth inner surface, the tubing is suited for a wide range of applications, including actuators, press machines, and food service equipment. Circle (17)

With strength approaching metals and the processability of plastic, Maranyl® A-690 from ICI Fibres, Greensboro, North Carolina, is a short fiber nylon 6/6 **thermoplastic that is one of the strongest available**. Reinforced with 50% glass fiber and heat stabilized, it offers lighter weight and easier processing than aluminum and magnesium, and is ideally suited to replace metal components in automotive, appliance, ordinance, and sport and leisure items. Because it is heat stabilized, the material can operate at high temperatures for long periods of time without any deterioration of its physical properties, and its inherent chemical and rust resistance also makes it adaptable to many hostile environments where metals can corrode over time. Circle (18)

A new type of chromatographic phase, functionally equivalent to monomeric bonded phases on silica, is **much more resistant to damage by acids and bases** due to bonding chemistry that creates an ultra-high density surface within the first few angstroms above the silica substrate. The coating, from **Research Corporation Technologies**, Tucson, Arizona, shows unprecedented stability to hydrolysis, and tests at both high and low pH prove its superiority to conventional monomeric bonded phases. The water-shedding layer also prevents growth of cracks caused by dissociative chemisorption, the sequential rupturing of interatomic bonds. The process is scalable and environmentally benign and may be easily adapted to treat fiber optic strands to prevent flex crack propagation. Other potential applications include crack-resistant and water-shedding windshields, labware, and insulations, as well as preservatives for such materials as masonry and statuary. Circle (19)

Grace MicroFiber™, ultra-thin polypropylene reinforcing fibers which **improve the**

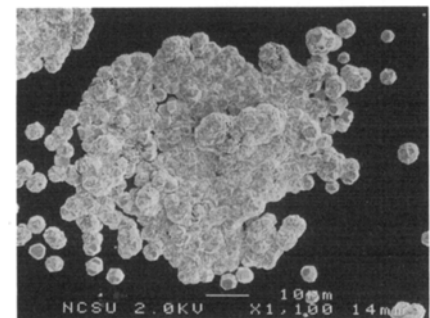
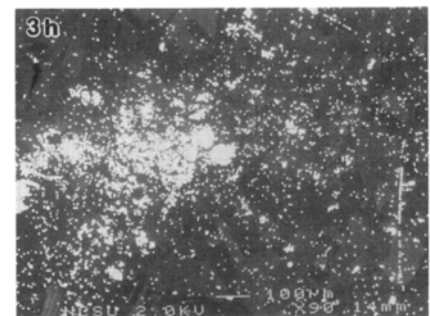
**crack-resistance and overall performance of concrete** without hindering finishing operations, has been introduced by **Grace Construction Products**, Cambridge, Massachusetts. Manufactured from 100% virgin polypropylene microfilaments, the additive reinforces and protects concrete against cracking due to plastic shrinkage and other internal stresses. According to the manufacturer, they can eliminate the need for welded wire fabric. The extreme fineness of the fibers makes them virtually invisible in fresh concrete—a major advantage in applications requiring good finishability and surface appearance. One pound contains over 50 million individual fibers. Circle (20)

**Fiberweb International Corp.**, Cambridge, Massachusetts, offers a Fiberweb 200, long-lasting, lightweight and durable fabric flashing that **creates a permanent moisture barrier**. Ideal for use in highly insulated veneer wall systems which tend to cause accelerated corrosion of masonry tiles and metal stud systems, it resists the caustics and alkalis found in concrete and mortar and ensures positive weeps for proper condensation. The flashing is constructed of a 1.5 mil polyester film bonded to a 20 × 10 fiberglass scrim for additional reinforcement during installation, and is coated with a black vinyl acetate film. Due to its high bond strength and reinforced construction, it is virtually impervious to degradation under most conditions. The material will not shrink, sag, or delaminate and is estimated to retain its properties for at least 100 years. Circle (21)

**Toshiba Corp.**, and **Showa Electric Wire & Cable Co., Ltd.**, a Toshiba Group company, Tokyo, Japan, has announced the joint development of a **high temperature superconducting tape for superconducting magnetic coils**. The new conductor, a bismuth-based oxide high temperature superconducting tape, achieves the highest current density yet obtained in high temperature superconductor: 66,000 amperes per cm<sup>2</sup> in liquid nitrogen at 77 °K (−196 °C). It is to be used for superconducting magnetic coils applied to magnetically levitated transport systems and magnetic resonance imaging systems. The conductor's capability to generate higher electric current and a strong magnetic field is also

expected to contribute to the practical applications of high temperature superconductors, replacing metal superconductors cooled with costly liquid helium. Circle (22)

Researchers at the NASA's **George C. Marshall Space Flight Center**, MFSC, Alabama, are putting continuous efforts to **synthesize diamond thin films at low temperature from liquid hydrocarbons**. The process involves laser-liquid interaction on a non-diamond substrate such as copper. The novel technique is simple, economical and controllable for the selective growth of diamond. The concept is highly applicable to the electronic industries where low tem-



George C. Marshall Space Flight Center

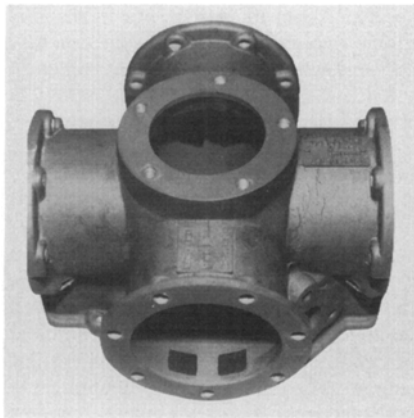
perature diamond processing is required without damaging the electronic properties of materials. The most significant advantage is that the substrate will not be exposed to the contamination environment like oxygen during a diamond thin film deposition process. Circle (23)

## EQUIPMENT/PROCESSING

A multi-step proprietary **coating process that produces a harder-than-steel surface** on aluminum and aluminum alloys, MAG-NAPLATE HCR™, is available from **General Magnaplate Corp.**, Linden, New

Jersey. The coating, identified as “synergistic” because it becomes an integral part of the aluminum surface, offers maximum corrosion resistance, abrasion resistance, improved mold release, resistance to chemical

attack, moisture resistance, permanent lubricity, high dielectric strength, and a low coefficient of friction. Coated parts demonstrate a hardness that can be compared to that of hard chrome-plated steel. Further-

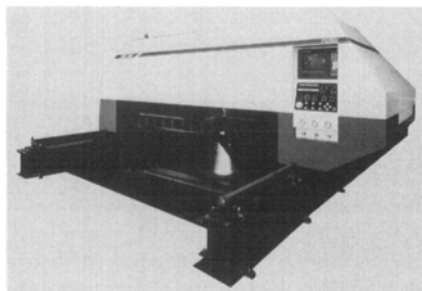


General Magnaplate Corp.

more, they cannot chip, peel or be nicked, scratched or flaked in normal use. The coating can be applied to parts of any configuration, any weight, virtually any size or thickness, including threaded members or other close tolerance parts. Circle (24)

**Wytech Industries**, Rahway, New Jersey, the leading supplier of straightened and cut medical grade stainless steel wire and wire parts, can now straighten and cut teflon-coated wire to customer specifications *without disturbing the coated surface*. By straightening and cutting pre-coated wire, the need for secondary coating sources is eliminated. The new one-step process makes it possible to avoid the problems commonly associated with coating parts after cutting: wasted time, excess scrap, additional handling, uneven and inconsistent coating, etc. Circle (25)

A new laser cutting system, the Tanaka LMX series, from **Mazak Nissho Iwai Corp.**, Schaumburg, Illinois, can cut heavy duty parts from up to 1"-thick steel. Until now, these parts have been cut with plasma arc and oxyfuel machines. The LMX technology is *faster, more accurate, and cleaner than plasma or oxyfuel cutting*. Cuts also have far less dross so finishing processes are often eliminated. As a result, the per-piece costs of the LMX laser are

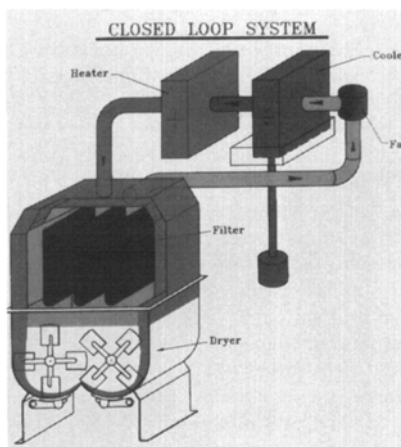


Mazak Nissho Iwai Corp.

equal to or lower than oxyfuel or plasma. Despite its larger size, the LMX has the agility of the fastest smaller lasers in the sheet metal industry. Circle (26)

**Precision Glass & Optics**, Santa Ana, California, has introduced new design techniques in fabricating all-dielectric, vacuum-deposited hot mirrors. Results yield transmission/reflection values *superior to commercial hot mirrors and traditional heat absorbing glass filters*. Longer mirror life is achieved without cracking or fading, even in sustained operating temperatures exceeding 600 °C. The design yields neutral color transmission, 8% higher visual transmission values, and exceptional blocking in the near infrared. Circle (27)

An entirely novel drying process is now being launched by **Forberg Dryers, Ltd.**, Larvik, Norway. Based on the principle of weightlessness of the Forberg mixer, it achieves *near-perfect contact between product and drying medium*. Pastes and filter cakes can be dried after backmixing, and powders can be agglomerated. In the mixer the materials are lifted by paddles to a state of weightlessness or mechanical fluidization at the point where they start falling down again. At this point the size or



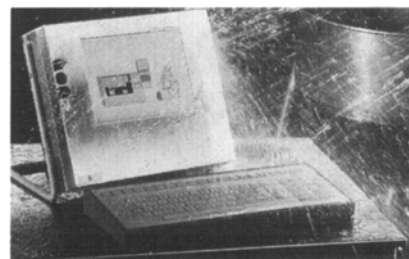
Forberg Dryers, Ltd.

weight of the particles have no influence, and the particles therefore spread out to expose a maximum surface area to the drying medium, usually hot air. The intimate contact between material and medium maximizes the rate of moisture transition from product to air and provides very high efficiency and energy utilization. Circle (28)

A safe, economical, and highly efficient process from **Research Corporation Technologies**, Tucson, Arizona, sepa-

rates lanthanides by reaction with supercritical CO<sub>2</sub>. The patented method *reduces energy costs and requires less labor and materials* than conventional processing techniques such as leaching. An aqueous suspension of material containing rare earths—preferably oxides—is mixed with supercritical CO<sub>2</sub>; lanthanides in the +III oxidation state reacts whereas +IV lanthanides do not react. The inventors have achieved yields of 95% of the normal carbonates—rather than hydroxy carbonates—after one hour at 40 °C and 100 atm. The carbonates were then separated by dissolution in very dilute acid. Thorium dioxide, zirconium dioxide, and even cerium dioxide either did not react or gave very low yields of carbonates under these experimental conditions. The company seeks partners to develop the process in exchange for intellectual property rights. Circle (29)

**Kontron Elektronik**, Sunnyvale, California, has announced a major advancement in providing *control and processing computer power for harsh environments*. The Kontron Operator Interface (KOI) provides the full power of a 386SL PC system in a compact, completely environmentally sealed vanadium steel enclosure. The entire system meets IP 65 protection require-



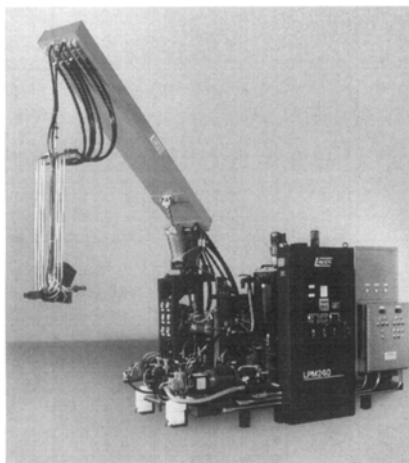
Kontron Elektronik

ments. This approach essentially eliminates the need for rack-mounted industrial computers and controllers in many applications. The equipment is designed for difficult manufacturing environments such as those found in ship building, automobile, food, chemical, or pharmaceutical industries. Circle (30)

An *advanced thin film deposition process* developed by **Ricoh**, West Caldwell, New Jersey, in cooperation with **Tohoku University**, Tohoku, Japan, will enable the cost-effective manufacturing of magnetic recording heads and discs with greatly expanded storage capabilities. The new process uses a proprietary plasma evaporation method to produce thin films of iron nitride (Fe<sub>16</sub>N<sub>2</sub>) with

enough magnetic saturation to store ten gigabytes of data per square inch—about ten times greater capacity than most current magnetic storage technologies allow. The new process forms magnetic thin films of the required density at a high deposition rate of 10 Å per second, in a room temperature operation that uses less expensive equipment and shorter cycle times. Circle (31)

**Linden Industries**, Peninsula, Ohio, recently introduced the LPM240 Urethane Processing System. Capable of processing a variety of two-component chemicals, the LPM240 offers a control package that pro-



Linden Industries

vides *one of the easiest set-ups in the industry*. The system is designed to process rigid foam, flexible foam, DCPDs or any two-component, non-filled urethane system at the rate of up to 240 pounds per minute. The machine has an infinitely variable ratio capability of 1:5 to 5:1. Circle (32)

A special *accessory for manually intensive spot curing operations* is the EFOS Dispense-Cure Headpiece, from **Efos, Inc.**, Mississauga, Ontario, Canada, which transforms the Ultracure 100 series UV spot curing systems into precise dispense/cure stations. The handpiece houses the standard 5 mm light guide, combined with a 10 cc syringe for applying precisely measured amounts of UV adhesives. It's designed to integrate with any manufacturer's dispenser and is available on its own or as a complete system with the Ultracure 100S. Circle (33)

**EDO Performance Coatings, Fiber Science Div.**, Salt Lake City, Utah, has announced a *major breakthrough in coating application technology*. Using a thermal spray process, EDO can now offer the commercial application of a vari-

ety of high performance thermoplastics as coatings. The patent-pending process is environmentally friendly, with no VOCs. The application is one-step, requiring no oven curing time. Circle (34)

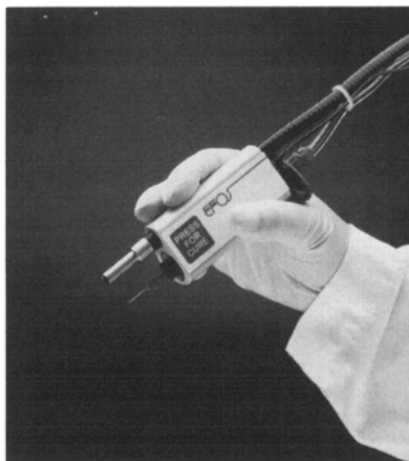
*Advanced forming techniques to produce seamless vessels, tubing, and liners from tantalum* and its alloys have been developed by **B-J Enterprises, Inc.**, Albany, Oregon. The company incorporates a combination of deep draw, spinning, and machining processes to produce high quality



B-J Enterprises, Inc.

formed parts with wall thicknesses from .003" and up, and height-to-diameter ratios of more than 20:1. Tantalum's inertness and high temperature strength make it an ideal material for vessels or tubing which must contain highly corrosive solutions or materials and/or be heated to very high temperatures. Circle (35)

Researchers at **Battelle Laboratories**, Columbus, Ohio, are experimenting with *infrared light to heat treat aluminum*. It is expected to be more efficient than conven-

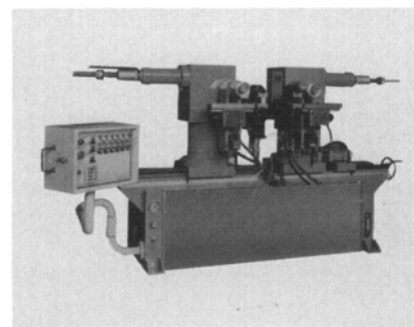


Efos, Inc.

tional gas or oil-fired heating methods. An infrared furnace monitors the heating rates, efficiency, and temperature uniformity while heat treating auto wheels of aluminum. Optimal heating required an average of five to eight minutes, and variations in temperature were less than 10 °F. In addition, electrical efficiency averaged 61% with the furnace. Circle (36)

A new class of lubricant with an impressive history in the automotive aftermarket has been introduced for use in stamping and deep draw metal applications. Tufoil from **Fluoramics Inc.**, Mahwah, New Jersey, is said to be the *most slippery lubricant available* anywhere in the world. It has been proven to lengthen die life, increase throughput speeds, improve part quality, and reduce scrap. Designed for heavy-duty stamping and deep drawing metals such as stainless steel, it employs a sophisticated dispersion technology of colloidal polytetrafluoroethylene (PTFE) particles and soluble molybdenum compound. The product differs from all other PTFE-based lubricants in its use of electrically charged, submicron particles that reject one another rather than agglomerating, settling and filtering out. Circle (37)

**S & S Machinery**, Brooklyn, New York, introduces its new line of economy twin head vertical tube benders. The series of machines allows the user to *double bend at a price usually reserved for single bend tube benders*. With high speed twin head compression tube bending, up to 6

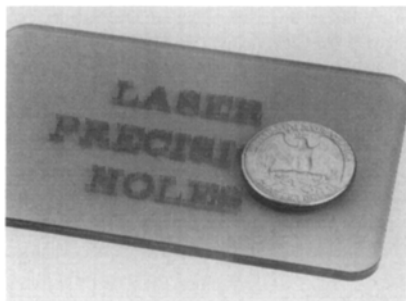


S & S Machinery

bends occur within 5 seconds. The combination of fast set up and simple operation makes the machine efficient and economical, with two bends accomplished in time now allowed for one. One model even has the capability of bending in and out of plane, making it the most versatile on the market today. Circle (38)

A new high speed noncontact microdrilling system for *boring small and microscopic holes in thin films and plastics* is being





The Industrial Laser Source

introduced by **The Industrial Laser Source**, Hopedale, Massachusetts. The ILS system is capable of boring holes down to 30 microns in under 200 microseconds, depending upon the material and depth requirements. Featuring a totally self contained CO<sub>2</sub> laser rather than conventional punches or hot needles which can wear out and distort the materials, the system is well-suited for processing thin films and plastics. Circle (39)

**Sullivan Mining Corp.**, Greenwood, Indiana, has developed a *new process to produce parts of ceramic or ceramic matrix composite via a liquid*, rather than

conventional powder, method. The process reacts a silicon-based liquid with ammonia, removing by-products, and then heat treating to produce a silicon nitride with low density, high strength, and diamond-like hardness. If the reactants are changed to include hydrocarbons, silicon carbide and other ceramics can be produced. The process requires a fraction of the cost of conventional means, and there is less damage to the reinforcing constituents. Also, as the liquids used in the process fill in the spaces between fibers and do not shrink as powders do, more complex shapes are possible. Circle (40)

## MEASUREMENT/TESTING/EVALUATION

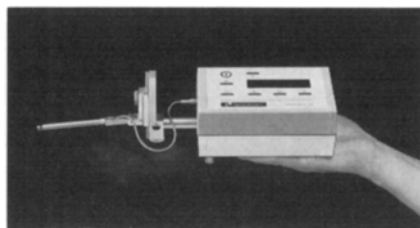
**Applied Systems, Inc.**, Annapolis, Maryland, has introduced new FTIR-based technology which is designed for use in chemical product and process development *to study reactions in-situ, under actual conditions*. ReactIR™ Reaction Analysis Systems permit rapid, quantitative analysis of reactants, intermediates, and products without disturbing reaction conditions. Re-



Applied Systems, Inc.

action pathways, mechanisms, and kinetics can be determined in real-time, and this information can be used to improve product quality and process performance. The systems are engineered to provide safety and performance under a wide range of temperatures, pressures and reaction conditions. They can be configured to meet the specific requirements of each reaction engineering application. Circle (41)

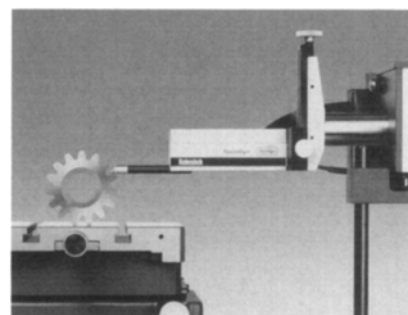
The portable, hand-held Surtronic 3+ for *precise measurement of surface texture at the point of manufacture*, has been introduced by **Rank Taylor Hobson Inc.**, Des Plaines, Illinois. The instrument, weighing about one pound and fitting into the palm of a hand, enables manufacturers to precisely measure the surface finish of components during production, allowing for quality improvements, increased productivity, and cost-savings. Applications range from measuring vertical or inclined surfaces, to the underside of components and within bores. It is essential for meas-



Rank Taylor Hobson Inc.

uring surface texture on components too large/small for conventional measuring instruments. Within the workshop, it can be used on line to monitor any deterioration in the production process through tool wear or chatter. Circle (42)

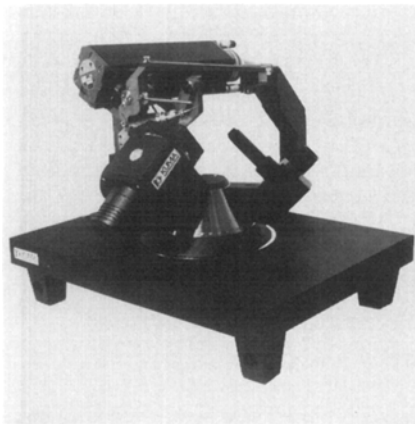
The new Focodyn optical probe from **Mahr Feinpruef**, Cincinnati, Ohio, allows *non-destructive surface texture measurement of soft, liquid, sticky, or highly polished materials*, including foils, paper, paint,



Mahr Feinpruef

magnetic disc media, rubber, and copier drums. It provides excellent discrimination of detail on highly polished surfaces where conventional diamond styli are unable to detect fine surface flaws. A non-contact instrument, it does not damage or alter the surface it measures. It is best suited for tribology research and advanced surface analysis, because it couples to the Mahr Perthometer S8P for evaluation and graphical presentation of surface profiles. The system can measure surface texture to one nanometer vertical resolution. Wear scar or run-in analysis is enhanced by DESA, a unique method of computing a cross-sectional area of bumps and pits. Circle (43)

A new four circle automatic x-ray diffractometer, controlled by a personal computer with easy-to-use self-prompting software, and a compact design for optimum space utilization is being introduced by **Advanced Diffraction Systems** of Natick, Massachusetts. The KUMAJM-4 Automatic X-Ray Diffractometer features *a detector which is tangentially mounted to permit greater reciprocal space* sampling and more open space around the instrument for increased flexibility when installing acces-



Advanced Diffraction Systems

sories. Controlled by a personal computer with user-friendly data collection software, automatic peak hunting and cell reduction algorithms permit the rapid identification and refinement of crystal lattice parameters. The system includes a compact 3K5 x-ray generator and NRCVAX crystallographic software which operates in 32-bit mode on the PC. Circle (44)

**Optical Associates Inc.**, Milpitas, California, has initiated its new service for the calibration of UV probes used to measure the exposure on wafer steppers producing narrow band illumination. The combination of *improved probe structure and new calibration equipment and procedures* results in an improved sensor-to-sensor matching specification of  $\pm 1.5\%$  versus  $\pm 3.0\%$  for older probes. In addition, the OAI standards for the new 365 and 436 nm probes have been verified by the U.S. National Institute of Standards and Technology (NIST) to measure within  $\pm 1.5\%$  of a NIST standard for the same wavelength. The basis of the improvement is a NIST traceable method using narrow band illumination during the calibration procedure. Other improvements include a redesigned aperture that more accurately follows the cosine response to incident light. Circle (45)

The **Physical Electronics Div., Perkin-Elmer**, Eden Prairie, Minnesota, has introduced the new PHI 5600(I)ci(i)XPS surface analysis system. The 5600(I)ci(i) provides complete XPS chemical state imaging with spectroscopy for a variety of applications. It offers several important benefits, including *a unique ability to separate the overlapping chemistries of a complex sample*, multi-point analysis, and multiple-point depth profiles. Additional benefits include rapid chemical state imaging, highest possible energy resolution, quantitative small area analysis, ad-

vanced data reduction capabilities, and spectral storage at each pixel. Circle ()

Recommended for any laboratory carrying out multistep sample preparation methods for elemental analysis or similar applications, the AP1000 Sample Preparation System from **Leeman Labs, Inc.**, Lowell, Massachusetts, permits *complete user control over the entire microwave heating process*. A computer-controlled feedback system automatically adjusts power output to meet user-specified reaction conditions for temperature and pressure. A monitoring vessel inside the microwave unit contains a

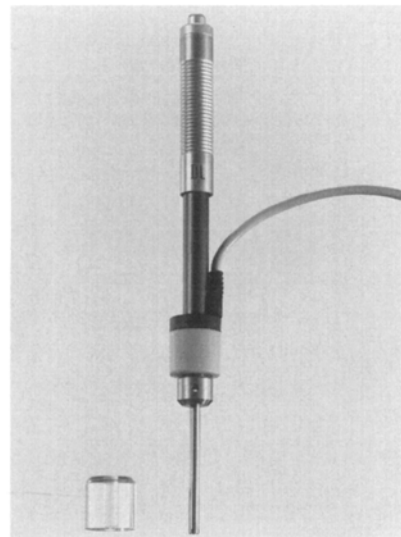


Leeman Labs, Inc.

temperature and pressure sensing system to constantly detect changes throughout the reaction. These and other unique features permits automated, user-specified control of the dissolution process not available on other microwave sample system. Circle (46)

Mechanical engineers, metallurgists, chemists, physical scientists, and technical experts in industry, universities and government with experience in evaluating the performance of materials are needed by the **U.S. National Institute of Standards and Technology (NIST)**, Gaithersburg, Maryland, *to conduct on-site assessments of laboratories that perform testing and inspection* of metals and fasteners. The assessors are required for a new National Voluntary Laboratory Accreditation Program to meet the requirements of the Fastener Quality Act of 1990. Individuals with a background in the testing and inspection of metals and fasteners, and with experience in laboratory management and operation are invited to send a resume to S. Wayne Stiefel, Fastener Program Manager, NVLAP, Rm. A162, Bldg. 411, NIST, Gaithersburg, MD 20899-0001, or call 301/975-4016 for more information.

*Hardness testing in extremely confined spaces or in deep grooves* is now possible with the introduction of the new impact



Equotip Associates

device DL for the Portable Hardness Tester from **Equotip Associates**, Norcross, Georgia. The long slender test tip of impact device DL gives access to many areas where hardness measurements were previously not taken because of space restrictions. With the addition of the new device, the Portable Hardness Testing system now offers a choice of seven different impact devices. Test results are automatically converted from the system-related "L" value to your choice of HV, HB, HRC, HRB, or HS, and are instantly displayed on the large LCD monitor. Circle (47)

**HPS Div., MKS Instruments, Inc.**, Boulder, Colorado, is introducing a *new line of hot cathode gauge sensors with filaments made of yttria-coated iridium*. The yttria filament operates at low temperatures and



HPS Div., MKS Instruments, Inc.

is resistant to damage from exposure to atmosphere. The new filaments are available in a variety of tubes, including glass envelope made of Pyrex® or Kovar® and nude. Circle (48)

A new thin film stress measurement system, the FLX-5200h, for use on semiconductor



Tencor Instruments

production wafers up to 200 mm in diameter is offered by **Tencor Instruments**,

Mountain View, California. The laser-scanning system is based on the company's FLX-5200 single wafer film stress measurement model and provides fast, automated handling with throughput of 60 wafers per hour. The system's precise wafer positioning capabilities and highly accurate measurements *allow a unique map of radial film stress to be generated*. Unlike other systems which can only map film thickness or surface topography, the Tencor FLX-5200h calculates the radial stress pattern across the wafer, producing a map of film stress. It features a patented dual wavelength laser design which allows measurements on all types of films, including metals, oxides, polyimides, and even silicon nitride. Circle (49)

The MTS Polymer Test System from **MTS Systems Corp.**, Eden Prairie, Minnesota, *performs all the tests that previously required four different testing machines*: Fatigue/crack growth, dynamic mechanical



MTS Systems Corp.

characterization, high rate impact/tensile tests, stress relaxation/creep tests. The system employs a new load frame design and the most modern test control and data acquisition system available in order to produce data superior to that from older systems on both high rate and fatigue crack growth testing. Circle (50)

## LITERATURE/DATA SOURCES

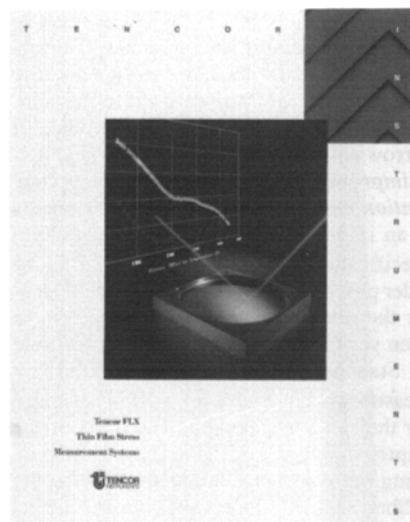
A new full-color publication offered by **Krautkramer Branson**, Lewistown, Pennsylvania, provides an overview of the company's *ultrasonic testing products and customer support services*. Illustrated and described are portable and systems flaw detectors, corrosion and precision thickness gauges, hardness testers, transducers, and production test systems. Services such as applications consulting, computer I/O and software support, and ultrasonic schools are discussed. Circle (51)

**Alcoa Wire, Rod & Bar Division**, Massena, New York, recently produced a four-page brochure on Alcoa Deltalloy™ 4032, a *highly wear-resistant, cold-finished alu-*

*minum alloy*. Because of its composition, Deltalloy 4032 requires no hard-coat anodizing, thereby eliminating extra processing steps and reducing production costs by as much as 50%. The material is composed of finely distributed silicon and nickel particles within the aluminum alloy for superior in-service wear resistance. Its residual stress control results in excellent machinability and drilling characteristics. Successful applications have occurred in master brake cylinders, bearings, hydraulics, sound recording devices, copier parts and gears. Circle (52)

The new Design Properties Profile from **LNP Engineering Plastics**, Exton, Pennsylvania, offers a succinct chart listing the *physical, mechanical, thermal, and electrical characteristics* of its 28 Thermocomp base resins. The wide selection allows customers to custom tailor a composite to a specific performance requirement. All figures are based on 30% glass fiber-reinforced composites, but in selected resins, LNP can provide glass fiber reinforcement up to 60%. Circle (53)

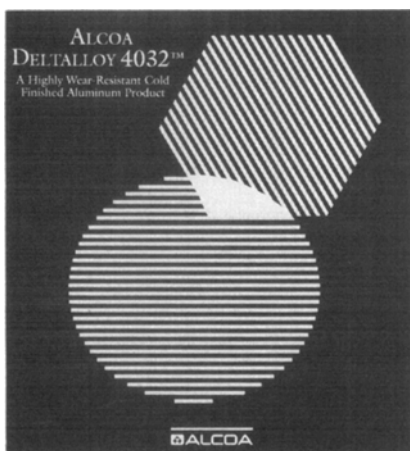
**Tencor Instruments**, Mountain View, California, has released a literature package that describes the FLX thin film stress measurement system. The eight-page brochure and data sheets on individual models are included for a complete description of the systems' capabilities. The system provides *highly specialized features for film stress measurement* at room temperature, as well



Tencor Instruments

as at temperatures up to 900 °C. Stress can be measured on nitride, oxide, metal, silicide, and polyimide films, on wafers up to 200 mm in diameter. In addition, patented technology allows accurate measurement regardless of the film's reflectivity, even on silicon nitride films on silicon. Circle (54)

Advanced Composite and Plastics Directory from **Adair Plastics & Composites, Inc.**, Oklahoma City, Oklahoma, contains word, phrase, acronym, and abbreviation definitions as used commonly throughout the advanced composite and plastics in-



Alcoa Wire, Rod & Bar Division



dustries. It also features a "working knowledge" *description of advanced composite and plastics definitions*. In addition, appendix charts and sample checklists, to aid in the overall understanding and support of the advanced composites industry, are included. The book is specifically designed for professionals who require a comprehensive reference on a day-to-day basis. Circle(55)

More than 52,400 new components from over 440 manufacturers have been added to the updated 1992 D.A.T.A. DIGEST Discrete Semiconductor library, available from **D.A.T.A. Business Publishing**, Englewood, Colorado. This is a 17% increase over earlier editions. The most substantial growth has been seen in diodes, with more than 22,800 new devices, and optoelectronics, with more than 16,900 new devices. The library offers the *most comprehensive coverage of discrete semiconductors* presented in an easy-to-use format. Sections are cross-referenced, and a logical format makes side-by-side comparisons easy. Circle (56)

All standards published by the **American National Standards Institute (ANSI)**, New York, New York, are now available on CD-ROM. This service, provided in cooperation with Information Handling Services (IHS), *simplifies and accelerates the process of gaining access to ANSI standards* and features: immediate access to related standards information via an index/cross reference feature; the ability to target precise information within texts via key-word search; and the updating of information every 60 days, thus keeping users aware of revision activity. Circle (57)

**Balzars Tool Coating Inc.**, North Tonawanda, New York, has recently introduced a 6-page brochure describing the benefits of its three PVD coatings in solving wear, release, and corrosion problems. The new flyer provides information on the *specific performance characteristics* for Balzer's titanium nitride, titanium carbonitride, and chromium nitride coatings. It details physical properties for each of the coatings, offers suggested applications, and presents performance test results. The coatings provide a wear resistant surface for a wide range of precision wear part applications such as: gears, bearings, sliding parts, and other similar component parts. Circle (58)

The **American Welding Society**, Miami, Florida, has just released its updated standard: Specification for Magnesium Alloy Welding Electrodes and Rods. It prescribes requirements for the *classification of bare*

*magnesium alloy welding electrodes and rods* for use with the gas metal arc, gas tungsten arc, oxyfuel gas and plasma arc welding processes. Classification is based on chemical composition of the welding wire. Standard sizes, finish, winding requirements, package forms and weights, product identification, and chemical compositions are also identified. Circle (59)

*Three more property databases* have been added to the **STN International**, Columbus, Ohio, network: **ASMDATA**, produced by ASM International®, provides property data on metals, alloys, plastics, and composite materials; **DETERM**, the DECHEMA thermophysical property databank, contains property data for organic and inorganic substances; **CHEMSAFE**, which provides data on flammable substances, is a joint project of the Bundesanstalt fuer Materialforschung und -pruefung, DECHEMA, and the Physikalisch-Technische Bundesanstalt. Circle (60)

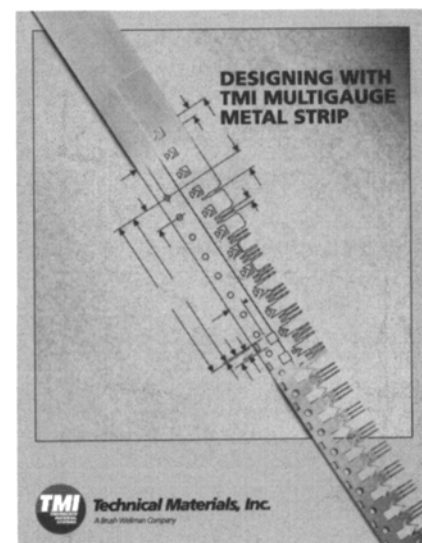
Drawing upon 50+ years of worldwide experience assisting customers with thousands of applications procedures, **Struers, Inc.**, Westlake, Ohio, has *systematized sample preparation into 10 step-by-step procedures* now published



Balzars Tool Coating Inc.

as part of a free 115-page, full-color **METALOG GUIDE™**. A user begins at the color-coded Metalogram™ which is a matrix of hardness vs. ductility, and is then directed to the optimized procedure for that particular material. Specific procedures include all preparation parameters; e.g. pressures and times for cutting, grinding, and polishing. Circle (61)

A wide range of *multigauge metal contouring technologies* for production of mechanical, electrical, and electronic components, is described in a new, four-page brochure from **Technical Materials, Inc.**, Lincoln, Rhode Island. Each TMI multigauge metal strip process method, including



Technical Materials, Inc.

milling, skiving, electron beam welding, edge skiving, and combined technologies, is described in full feature/benefit format. Overall multigauge metal strip benefits, such as more consistent formability, reduced die wear, improved stampability, and elimination of subsequent joining operations, are also presented. Circle (62)

A new brochure featuring **Jergens, Inc.**, Cleveland, Ohio, metric tooling components, has been published. The 32-page catalog describes and illustrates its *complete line of metric components for tooling and production*. Products include the Ball Lock™ Mounting System, hoist rings, spring and ball plungers, thread repair inserts, toggle clamps, handwheels, knobs and handles turning tooling, drilling, and clamping products. Detailed charts and dimensional diagrams provide product specifications. Circle (63)

VIC-3D® from **Sabbagh Associates, Inc.**, Bloomington, Indiana, is *engineering analysis software for eddy-current technology* to monitor production of metals and laminates; design probes; simulate flaws for certification testing; quantify probe responses to surface-breaking cracks, embedded cracks and inclusions; predict intergranular attack and other types of corrosion; provide noise-free estimates for probability of detection; and simulate flaw shapes for inversion. It is completely menu-driven, requires no mesh generation, displays 2D- and 3D-graphics with vector, linear, contour, and surface plots; and uses state-of-the-art window presentation including overlaying, repositioning, and resizing. It is available in both DOS and UNIX versions. Circle (64)

A new six-page color brochure from **Pli-brico Co.**, Chicago, Illinois, highlights its installation methods, manufacturing practices, technical/engineering support, experience and sales service behind a *line of monolithic refractories* for furnaces, boilers, incinerators, kilns, and a variety of other heat-containment systems. Circle (65)

A brochure that gives an overview of machining with polycrystalline diamond and polycrystalline cubic boron nitride is now available from **GE Superabrasives**, Worthington, Ohio. Entitled "Polycrystalline Products for Machining Applications," the flyer explains the *performance and productivity advantages of superabrasives* and provides application guidelines for selecting specific products. Illustrated mini-case histories provide examples of the materials' superior performance compared with conventional abrasives such as tungsten carbide and aluminum oxide. Circle (66)

New literature on the LFE (Life-Fatigue-Endurance) test bases and fixtures of **Fa-**



Fatigue Dynamics, Inc.

**tigue Dynamics, Inc.**, Walled Lake, Michigan, provides an *overview of fatigue test capabilities*, including bending, torsion, tension/compression, precracking, combined stress, shake table, and component testing to determine failures of materials, devices, or structures, that will be subject to cyclic loading. In addition to manufacturing and marketing its own line of equipment, the company services and upgrades the testing equipment of several other manufacturers. Circle (67)

The expanded, best, and most up-to-date edition of the annual "U.S. Key Personnel List" has been issued by **Composite Market Reports, Inc.**, San Diego, California. The 250+-page comprehensive directory is the latest update of the original and premier list of key personnel at large and small *organizations currently involved with high-performance composite materials*, processes, and products in the U.S.

and Canada. The Directory is color-coded into sections: industry, government, etc., with separate sections listing suppliers, manufacturers, research institutes, consultants, and miscellaneous related organizations. Circle (68)

A new eight-page publication, "Fresh Approaches to Mould Steel Selection," is now available from the **Nickel Development Institute**, Toronto, Ontario, Canada. One in a series of NDI publications covering a *wide range of applications and properties*, including fabrication, of nickel-containing materials, it includes tables showing typical compositions of plastic mould steels, metallurgical data on mould steels and the relative cost of various alloys. Several provocative sections, including 'unconventional' approaches, and lowering barriers to progress are featured. Circle (69)

The **Electric Power Research Institute (EPRI) Center for Materials Fabrication**, Columbus, Ohio, has updated CMF TechCommentary, Vol. 1, No. 4, on "Laser Welding." The revised publication provides *updated information and reflects advancements in the laser welding technology* that have emerged since its original issue in 1984. The document addresses lasers as welding tools, as well as factors to examine before considering the laser's use in welding applications. Inherent laser characteristics, such as high-density power and high-speed, for high-volume production, are covered. Technical information is provided as well, including materials suitability, welding depth and speed, joint design, and work support issues. Economic considerations are also provided, including trade-off between the costs of laser power and speed; capital equipment costs; and the cost of consumables such as electricity, water, and laser and shield gases. Circle (70)

## INTERNATIONAL RESEARCH CENTERS

Material surfaces can *gain strength and durability and withstand friction* with less damage when treated with short pulses of ultraviolet laser light, according to researchers at **Los Alamos National Laboratory**, Los Alamos, New Mexico. The surface chemistry and surface microstructure of a material can be changed for the benefit of many applications with the application of ultraviolet light. The process has potential applications in aerospace, in the fabrication of lightweight, heat-resistant engine parts, and in the development of structural components that

slide easily without lubrication. The Los Alamos team uses an excimer laser—available commercially at a competitive price—to generate ultraviolet light. It works by introducing an electric discharge into a chamber filled with krypton fluoride gas. The discharges excite dimers, or pairs of gas molecules, which emit light. The process effectively treats metals and ceramics coated with metal. In the latter case, the metal and ceramic substrate mix during melting and form an alloy. Compared to other resurfacing technologies, the process is extremely fast.

An additional benefit is that some metallic surfaces treated with ultraviolet light not only harden, but slide against each other four times more easily than non-treated surfaces. Circle (71)

Physicists at the U.S. Department of Energy's **Ames Laboratory**, Ames Iowa, and Iowa State University have predicted a startling new behavior in the growth of thin metal films: when a film of gold is grown in a vacuum on a silver base, the gold actually *grows under the surface of the silver*, rather than on top of it. The discov-

ery could have a significant impact on the production of integrated circuits and other technologies. Using sophisticated computer models of atomic-scale interactions, the researchers found that a layer of gold atoms should grow under the first layer of silver atoms. Subsequent experimental observations at IBM Corporation's San Jose, California laboratory support the model.

Because the vacuum in a computer model can be perfect and the silver perfectly pure, however, in an experiment, these two characteristics can never reach perfection. Therefore, the computer model is currently being modified to study some of the intermediate stages of the growth process. An attempt is also being made to learn how these growth patterns affect surface proper-

ties of the metal films. The project could aid in the development of growing thin metal films with certain desirable characteristics, such as improved adhesion, magnetic properties, or electrical conductivity, leading to improved technology in integrated circuits or magnetic recording heads, that use thin metal films.

Circle (72)

## UNIVERSITY VIEW

The DIAMond Database is a menu-driven, PC(IBM or compatible)-based *bibliographical database covering diamond coatings, diamond-like coatings (DLC), and cubic boron nitride coatings(CBN)*. It contains over 3800 entries and is comprised of technical, scientific, and popular papers, plus patents. There are over 2100 entries on diamond coatings, 1500 on DLC and 150 on CBN. This database was initially developed for the internal use of the Tribology Section of the Tooling and Process Engineering Dept. of the **Danish Technological Institute**, Aarhus, Denmark, to keep track of the growing number of papers collected by professionals working in the field. Papers in languages other than English are less well represented and the majority of the patents are U.S. patents. However, about 550 of the most important journals, including proceedings, are covered. The collection is revised every six months. A demo version is available.

Circle (73)

**The University of Washington**, Seattle, Washington, under a joint contract with the U.S. Strategic Defense Initiative and the Office of Naval Research, has discovered a series of chemical reactions that could start *a new chemical and materials industry*. These reactions allow polymers to be made from a cheap, abundant source—sand—instead of petroleum. The process operates at 300 °F compared to 2,000 °F for the conventional process and is estimated to eventually cost one-tenth as much as current methods of silicon feedstock compound preparation. The basic reaction combines an ethylene glycol and a caustic agent, such as potassium hydroxide, with sili-

con dioxide—similar to dissolving beach sand with antifreeze and drain cleaner. In solution form, silicon can be easily processed by combining it with different diols (a class of alcohols) to create a wide range of existing and novel compounds. Compounds formed in this process have five bonds and tend to be stronger than those of the most common four- or six-bond silicon compounds. Further, five-bonded silicon may represent an alternative to sol-gel processing. Because polymer precursors will not require hydrolysis as part of the processing, they may offer some advantages over sol-gel processing of glasses and ceramics, especially for generating multicomponent glasses.

Circle (74)

Professor Ulrich Goesele, **Duke University**, Durham, North Carolina, has obtained what may be the first U.S. patent covering an easy-to-work-with, inexpensive material which—unlike normal silicon—*can convert electricity into visible light*. The light-emitting properties of porous silicon could allow it to be used for lasers, in computers that operate with light as well as electricity, and in color televisions. Electrons moving through porous silicon appear to be permitted higher energy levels, or increased band gap, than those in ordinary silicon. Such higher energies mean that the electrons can emit photons of light. The patent covers, among other potential uses of porous silicon in semiconductor applications, a new type of photovoltaic solar cell. The cell could convert different wavelengths of light into electricity more economically than those of commonly used crystalline silicon solar cells.

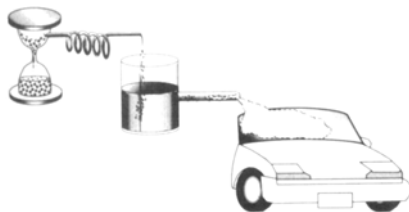
Circle (75)

Scientists at **Cornell University**, Ithaca, New York, are exploring the interior of solid materials with laser pulses to investigate *how sound waves can be used nondestructively to characterize a solid*. Focused nanosecond laser pulses are used to “thump” specimens, in a manner similar to the way geologists “thump” the

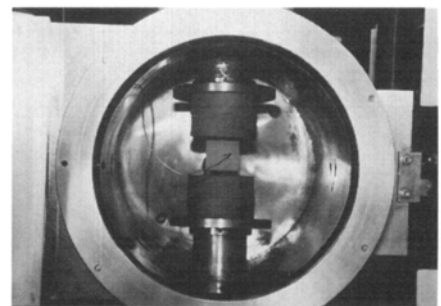
ground to excite vibrations that are reflected and measured. The frequencies used to measure material specimens are about 10 million times higher than those used by seismologists. The technique is being used initially to probe the elastic characteristics of materials. In principle, the spatial and temporal variations of a propagating acoustic wave contain all the information needed to extract not only the elastic properties, but also the microstructure and defects and the distribution of defects in a material. A collaborative effort has brought together expertise in quantitative ultrasonics, laser techniques, and data acquisition and processing to develop the interpretive tools required to ‘back out’ the nature of the materials from the signals generated. With the technique, the sample is excited only at a fine spot with a laser and waves are detected at a particular point. Even at this focused study a staggering amount of data may be obtained.

Circle (76)

A research team at the **University of California at Davis**, Davis, California, has *consolidated powdered metals and ceramics to near 100% density in seconds* using a new process developed by **Sodick, Inc.**, Yokohama, Japan. The system densifies materials faster with less energy and at less cost than existing methods, such as hot isostatic pressing. There are considerable applications opportunities within the automobile, aircraft, and aerospace/defense industries.



The University of Washington



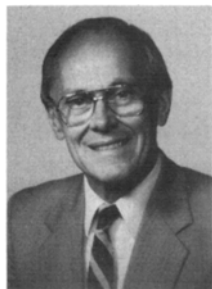
University of California at Davis

The success of the process is due in part to rapid, highly charged electrical sparks that excite the shell, or outer layer, of each tiny metal particle to reduce oxidized impuri-

ties. With individual particles in such a purified state, only modest pressure is required to consolidate them into high density materials.  
Circle (77)

*Do you have literature or news you'd like highlighted in this feature? Send your contributions to the Managing Editor.*

## KUDOS



Wally Bamford

**Wally Bamford**, Director of **Hinderliter Heat Treating**, Kitchener, Ontario, Canada, has been elected President of the **Metal Treating Institute**, Neptune Beach, Florida, a trade association of

commercial heat treating companies throughout the world. He is the first non-U.S. chief elected officer of the 59-year-old MTI.

**Norton Diamond Film**, Northboro, Massachusetts, has named **Robert A. Hay** as Manager, Engineering and Field Applications. In his new position Hay will identify new applications for the company's diamond wafers and coatings, which are made using a proprietary chemical vapor deposition (CVD) process.

The newly appointed Process Engineering Manager for **HTG Thermal Treatment**



Robert A. Hay

**Center, Inc.**, Cleveland, Ohio, is **P.N. Balgude**. He brings several years progressive experience in commercial heat treating facilities in India and the U.S., and will be responsible for establishing and implementing thermal treatment process controls.

Assuming office in June 1993, as the president of the **American Society of Mechanical Engineers (ASME)**, New York, New York, is **John H. Fernandes**. He has been a consultant since 1990 and has served ASME in various offices and as a member of numerous committees. Fernandes' engineering specialties include thermal/fluid sciences, environmental control studies, and fuels/fuel usage.

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