# Research Resources

*A summary of new products and services for materials research...*

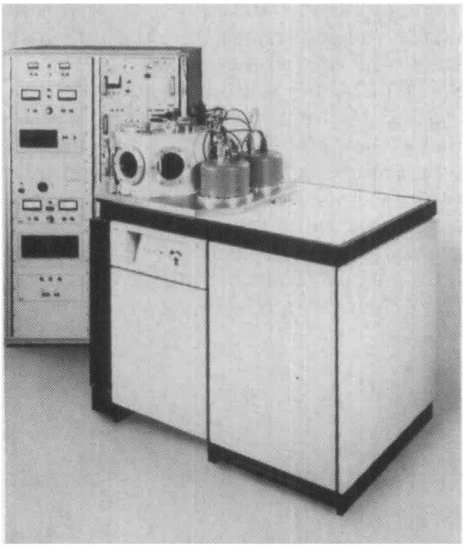
**Series on High Temperature Superconductivity**: Three proceedings volumes review late news from front line researchers: Vol. I: *Proceedings of the Adriatico Research Conference on High Temperature Superconductors* (Trieste, Italy, July 6-8, 1987), edited by S. Lundqvist, E. Tosatti, M. Tosi, and Yu Lu; Vol. II: *Proceedings of the International Workshop on High Temperature Superconductivity*, Beijing, People's Republic of China, June 19-July 1, 1987), edited by Z.Z. Gan and G.J. Cui; and Vol. III: *Proceedings of the Drexel International Conference on High Temperature Superconductivity* (Philadelphia, PA, July 29-30, 1987), edited by S. Bose and S. Tyagi. World Scientific Publishing Co. Pte. Ltd., Farrer Road, P.O. Box 128, Singapore 9128; 2786188

**High $T_c$ Update**: New publication/information service provides information on new research opportunities in superconductivity. Issues cover research, current references, news, meetings, and newsletters. Published for the Office of Basic Energy Sciences, U.S. Department of Energy, under contract with Ames Laboratory, *High-$T_c$ Update* is available as hard copy and through electronic mail. Hard-copy *High $T_c$ Updates* will be provided at least once a month. E.O. Feinberg, 12 Physics, Ames Laboratory, Iowa State University, Ames, IA 50011; (515) 294-3675.

**Superconductor Week**: Newsletter presents news and expert analysis on superconductivity in 48 issues per year. Written by editors and reporters who have extensive experience in energy and high technology in the U.S. and abroad, coverage will include: basic research, public policy, funding, development, and international competition. C. David Chaffee, a veteran high-technology author and newsletter editor and reporter, will head the editorial staff. Atlantic Information Services, Inc. (AIS), 1050 17th Street, N.W., Suite 330, Washington, DC 20036; (202) 775-9008.

**Oxide Powders for Superconductors:** Major producer of fine inorganic chemicals and a leading manufacturer of separated rare earths, including lanthanum and yttrium compounds, will provide ready-to-use rare earth/copper/alkaline earth oxide powders for producting superconductors. Separated rare earths are available in a variety of forms with purities to 99.99%. Rhône-Poulenc Inc., Black Horse Lane, Monmouth Junction, NJ 08852; (201) 821-3597. Rhône-Poulenc Minerale Fine, Cedex 29, 92097 Paris La DeFense, France.

**Superconductive Sputtering Targets:** Y-Ba-Cu-O and La-Ba-Cu-O superconducting sputtering targets in various stoichiometries are now available to support research work. Manufacturer also supplies sputtering and etching equipment, high purity metals, and ceramics to electronics, computer, and telecommunications industries. Materials Research Corporation, Orangeburg, NY 10962; (914) 359-4200.



**Sputtering System for Superconductor Research**: "Sputter-up" design of the CVC 601 system allows sputtering from powders, which permits easy composition adjustment for R&D of various materials. Designed primarily for R&D and for low volume production use, process development on the 601 can be directly transfered to the high volume CVC 2800. Zinc sulfide, and yttrium oxide, indium oxide, tin oxide, and indium/tin oxide mixtures are successfully being sputtered from powders. Deposition by sputtering of new superconductors such as barium, lanthanum, and copper oxides is under investigation. CVC Products, Inc., 525 Lee Road, Rochester, NY 14603; (716) 458-2550.

**Ultra Stable HV Power Supplies**: New units offer voltage stability never before achieved in the range of 100 kV to 500 kV/1 mA. This breakthrough offers new prospects in physical research, especially with ion beam analysis in solid state physics. Designed for use with particle accelerators, the units provide a reliable voltage with an unprecedented low ripple (better than $2 \times 10^{-4}$ with typical load of 500 pF). They can be operated in a constant voltage or a constant current mode. For safety the stored energy has been minimized and the units have been short circuit protected. A remote control panel with indication of the actual output-voltage and output-current is included. High Voltage Engineering Europa B.V., P.O. Box 99, 3800 AB Amersfoort, The Netherlands; 31 33 19741.

**Niobium Powder for Superconductor Wire**: Free-flowing high purity niobium powder blended with copper or other materials for manufacturing superconductor wire exhibits high ductility when blended with copper or other materials, extruded into rods, and drawn into wire for superconductor applications. Available in -35+325 MESH (500–45 microns), NMI niobium powder is produced in an inert atmosphere by the ceramic-free Rotating Electrode Process (REP™), resulting in high sphericity with no hollow particles. Nuclear Metals, Inc., 2229 Main Street, Concord, MA 01742; (617) 263-3119.

**High Resistivity Films on Glass or Ceramic As Fired**: High resistivity films for the production of hybrid circuits feature sheet resistivities up to 2,000 ohms/sq on glass and 1,500 ohms/sq on ceramic. Ideal for hybrid circuits and resistive networks where high value precision resistors are required, the guaranteed absolute TCR is ±50 ppm/°C from −55 to +150°C. CerA Resistive films are supplied on blank substrates and as etched geometries, and are available in sizes up to 4 inches square. The spread of R-Final on glass and glazed ceramic is ±10% on a complete delivery; ±14% on ceramic as fired. Balzers Optical Corporation, Thin Film Electronic Products, 170 Locke Drive, Dept. SK, Marlborough, MA 01752; (617) 481-9860.

**Process Economics Analysis for Advanced Ceramics Manufacturers**: Over the past 35 years, CRA has developed, tested, and updated a technique to estimate capital and manufacturing costs for a wide array of products and processes, including high performance materials such as advanced ceramic powders, parts and composites. The analysis (1) creates a process flowsheet; (2) analyzes and segments the flowsheet into unit operations and processes; (3) estimates capital and operating costs of known unit operations and processes; and (4) develops a logic diagram that demonstrates why the forecasted economics are likely to be correct. Charles River Associates, Inc., 200 Clarendon Street, Boston, MA 02116; (617) 266-0500.

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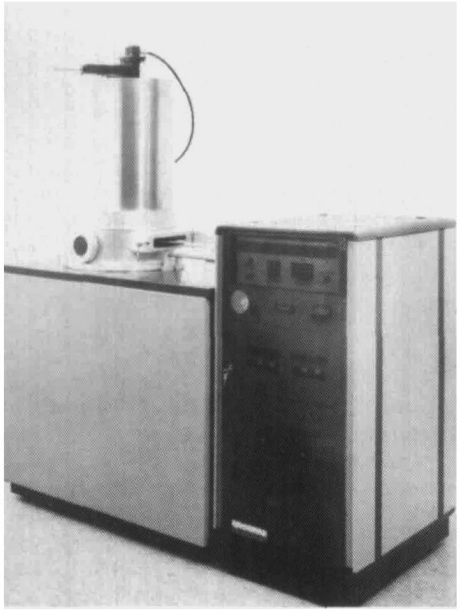


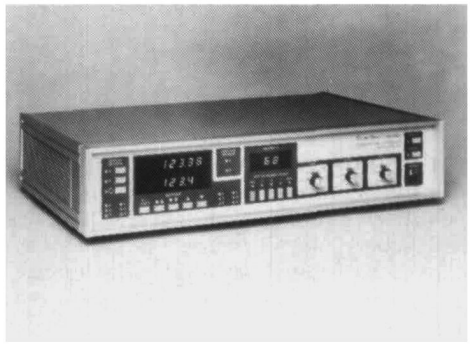
**ECR Plasma Systems**: ECR 2000R Etching System can achieve etch rates up to 100 times faster than existing systems with excellent anisotropy and negligible damage risk. The ECR (electron cyclotron resonance) principle employs microwave energy, in conjunction with a powerful magnetic field, to achieve a very high density, low energy ion flux by means of electron resonance. This dense ion flux is confined in the wafer area to give high rate anisotropic etching combined with very low energies. The ECR 3000R can run at low temperatures and pressures. On particularly sensitive devices, the ECR 3000R grows thermal quality films at 10 times normal PECVD rates at ambient temperatures. Operation is possible below 1 mT. Microscience, Inc., 41 Accord Park Drive, Norwell, MA 02061; (617) 871-0308.

**Advanced Semiconductor Fundamentals:** Book by Robert F. Pierret of Purdue University is the sixth volume in Addison-Wesley's *Modular Series on Solid State Devices*. It contains an advanced level presentation of the underlaying basic information, concepts, models, and equations routinely used to describe the operational behavior of solid state devices. Although a general reference for anyone dealing with solid state devices, this volume is targeted for beginning graduate students in electrical engineering and other closely related fields of study. Addison-Wesley Publishing Company, Reading, MA 01867; (617) 944-3700.

**Metal and Polymer Matrix Composites**: Book edited by J.A. Lee and D.L. Mykkanen, describes the status of research on metal and polymer matrix composite systems by government and commercial laboratories. It includes data on mechanical, thermal, and physical properties of advanced metal matrix and polymer matrix systems. The information in the book is from *Advanced Materials Research Status and Requirements: Volume I—Technical Summary*, and *Volume II—Material Properties Data Review*, prepared for the U.S. Army Strategic Defense Command, March 1986. Noyes Publications, Mill Road, Park Ridge, NJ 07656; (201) 391-8484.

**Multifunction Digital Thermometers**: New Models 201 (single sensor input) and 208 (eight sensor input) digital thermometers incorporate functions not otherwise available in economically priced temperature monitors. Thermometers display temperature to 0.1 units above 100, and to 0.01 units below 100 in °C, °F, or K, and display sensor voltage from 0.000 to 2.999 volts. The temperature range is -250°C(23 K)–200°C(473K) with an accuracy within ±0.5°C. Other functions include front panel over-temperature or under-temperature setpoint and monitoring of control setpoint values. Contacts provide a convenient interface with a central building alarm system. Lake Shore Cyrotronics, Inc., 64 East Walnut Street, Westerville, OH 43081; (614) 891-2243.

**Single-Wafer Plasma Etch Systems**: Unlike previous etch systems, the Model 6100 series provides exceptional control of wafer temperature during processing, which eliminates photoresist burning without pretreatment in most applications. Process uniformity and selectivity are significantly improved. The systems include two to four fully isolated process chambers and a choice of reactive ion, conventional plasma, or downstream etching. The separate chambers can be used to etch specific layers of composite structures. The 6100 series can etch all films typically encountered in silicon-based integrated circuit production, including aluminum copper alloys. Varian Associates, Inc., Semiconductor Equipment Group, 611 Hansen Way, Palo Alto, CA 94303; (800) 544-4636.



**Advanced Cryogenic Temperature Controllers**: Model DRC-91C high performance temperature controller is well suited for low and medium temperature cryogenic research and materials analysis in the 1.4K to 800K (−272° to 527°C) range. Easily installed input cards accommodate virtually any type of cryogenic sensor. Two input cards with sensors may be used concurrently to monitor temperature at more than one point or with more than one sensor type. An optional input scanner provides temperature monitoring of up to six sensors. The DRC-91C provides three-term real-time analog control resulting in control stability to better than ±0.001K below 30K in a properly designed system using a diode sensor. Lake Shore Cryotronics, Inc., 64 East Walnut Street, Westerville, OH 43081; (614) 891-2243.

**NMR Imaging Spectroscopy Systems**: A Varian Associates and Siemens joint venture offers nuclear magnetic resonance (NMR) imaging spectroscopy systems for industrial and research applications. The combination of NMR imaging with NMR spectroscopy will allow researchers to look at detailed chemical information from selected regions of live subjects. The products are expected to find use in applications ranging from small animal research to materials testing, especially the analysis of polymers and other specialized materials. Spectroscopy Imaging Systems Corporation, 1120 Auburn Street, Fremont, CA 94538.

**Advanced Ceramic Powders**: Advanced ceramic powders are available for high performance engineering applications for fabricated components and coatings. Typical applications include wear- and corrosion-resistant products, bioceramic implants, thermal barrier coatings, cutting tools, electronic sensors, and automotive components. The processing system uses electrorefining technology combined with precision classification techniques to produce high quality homogeneous materials with consistent chemical and physical properties. Products can be tailored to individual industrial needs. Unitec Ceramics Limited, Doxey Road, Stafford ST16 1EA, England; (0785) 223281.



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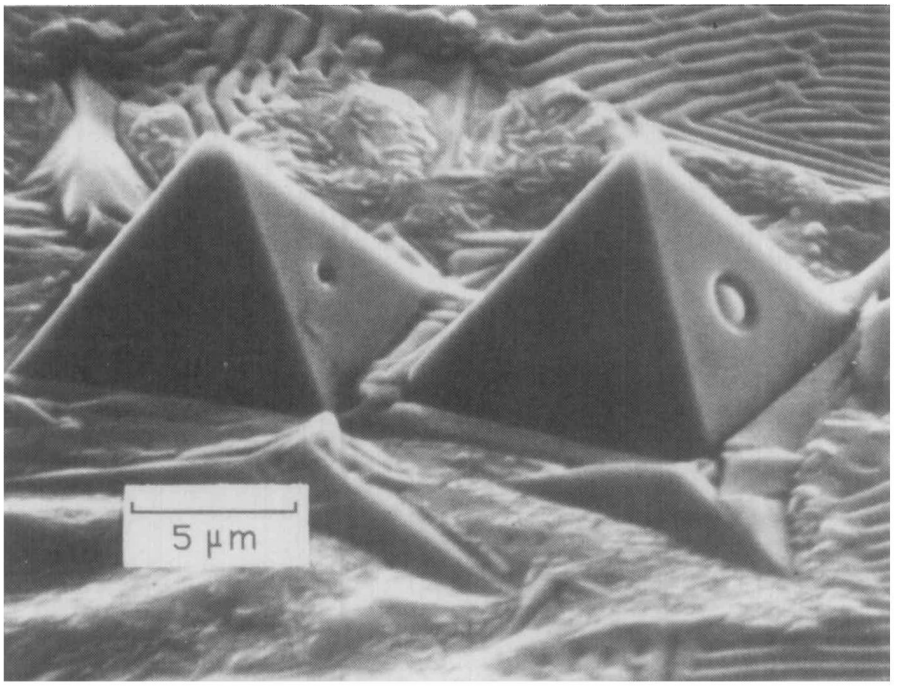
## Editor's Choice

*Figures appearing in the EDITOR'S CHOICE are those arising from materials research which strike the editor's fancy as being aesthetically appealing and eye-catching. No further criteria are applied and none should be assumed. When taken out of context, such figures often evoke images beyond and unrelated to the original meaning. Submissions of candidate figures are welcome and should include a complete source citation, a photocopy of the report in which it appears (or will appear), and a reproduction-quality original drawing or photograph of the figure in question.*




The EDITOR'S CHOICE for this issue appears to be an aerial photograph of huge ancient pyramids set among desert dunes in the late afternoon. The scale marker, of course, informs us that we are really viewing a micrograph of growths on a material surface. These crystallites were observed on the inner surface of a shrinkage cavity formed on solidification of a nickel-tin eutectic alloy sphere levitated in microgravity aboard the space shuttle. The precise origin of these crystals, the composition of which differed from the bulk alloy, could not be determined by the authors, T.J. Piccone et al., who reported their study in *Materials Processing in the Reduced Gravity Environment of Space*, edited by R.H. Doremus and P.C. Nordine (Mater. Res. Soc. Proc. **87**, Pittsburgh, PA, 1987) p. 47.

## ERRATA

The photo showing the structure of a high temperature superconductor (May/June, Vol. XII No. 4, p. 15) should have been credited to Argonne National Laboratory.

Symposium J Organizers (May/June, Vol. XII No. 4, p. 77) should have been identified as follows (left to right): H. King, G.E. Brown, Jr., and R. Jeanloz.





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