Livermore Researchers Test High-Power Tabletop Laser

Researchers at Lawrence Livermore National Laboratory successfully tested a high-power tabletop-sized laser that can produce intense light pulses with peak power in excess of 2.5 trillion watts by compressing light into a picosecond pulse. The laser system is built on a 10 foot by 20 foot steel table.

According to project leader Michael D. Perry, the focused high-power laser pulse has an electrical field 10 times stronger than the field that binds electrons to atomic nuclei, and opens new areas of physics for scientific study. Perry also said the $500,000 machine could deliver its pulse of laser light every 50 seconds at a cost of less than 10 cents per pulse, far lower than current high-power laser sources.

Michael Campbell, LLNL Deputy Inertial Confinement Fusion Program Leader for Experiments, said the development of an inexpensive high-power source will permit dense plasma-laser experiments and other research work to be investigated within a university environment rather than be limited to a few national laboratories.

Possible research applications include the production of holograms of the DNA within living cells, study of the effects of high-powered lasers on atomic nuclei, investigation of dense cold plasmas, and investigations into the effects of high intensity optical fields.

The heart of the new system is a neodymium phosphate glass multipass amplifier developed by LLNL using components supplied by Quantel International of Santa Clara, California. Known as a regenerative amplifier, the device multiplies pulse power more than 10 million times as it bounces back and forth through a laser cavity. Following the regenerative amplifier are three single-pass amplifiers which continue to boost pulse power. After amplification, the pulse is compressed to a duration of one picosecond, bringing peak power to 2.5 trillion watts. A fourth single-pass amplifier that will provide even more power—up to 12 trillion watts—is being installed.

Laboratory scientists credited a recognized technology only recently applied to lasers—chirped-pulse amplification—for their ability to successfully produce short, high-powered pulses. Chirped-pulse amplification, a process in which diffraction gratings are used to stack a pulse of light, one frequency or color atop the other, was originally developed to increase the power of radar installations.

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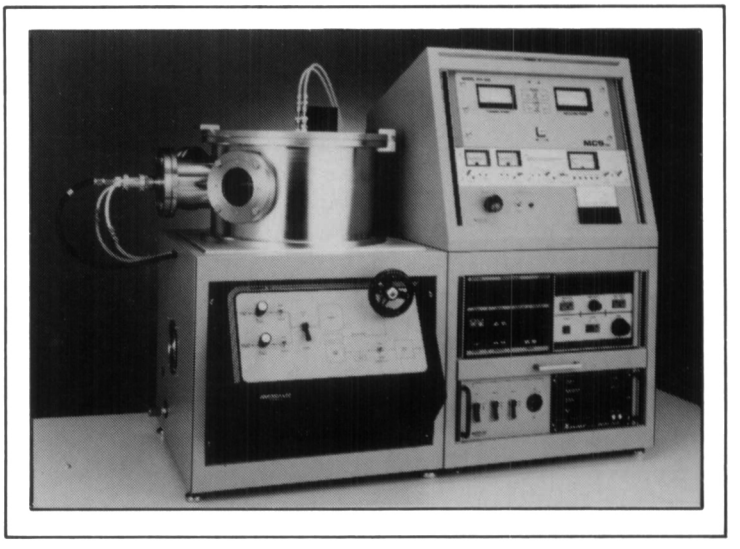

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C.G. Levi Receives ASM's Grossmann Award

Carlos G. Levi, associate professor, Department of Materials and Mechanical Engineering, University of California, Santa Barbara, received the Marcus A. Grossmann Young Author Award of ASM International.

The award, established in 1960 in memory of an eminent metallurgist, research director and author, honors an author or authors under 40 years of age whose paper has been selected as the best of those published in a specific volume of *Metallurgical Transactions*. Levi received the award for his paper on "The Evolution of Microcrystalline Structures in Supercooled Metal Powders," published in the March 1988 issue of *Metallurgical Transactions A*.

The focus of Levi's research at the University of California is the microstructural development of structural materials with special emphasis on solidification processing. A member of the Materials Research Society, his interests range from the formulation of computational models for microstructural evolution to advanced processing and characterization techniques. He is also active in the development of instructional software for materials science education.

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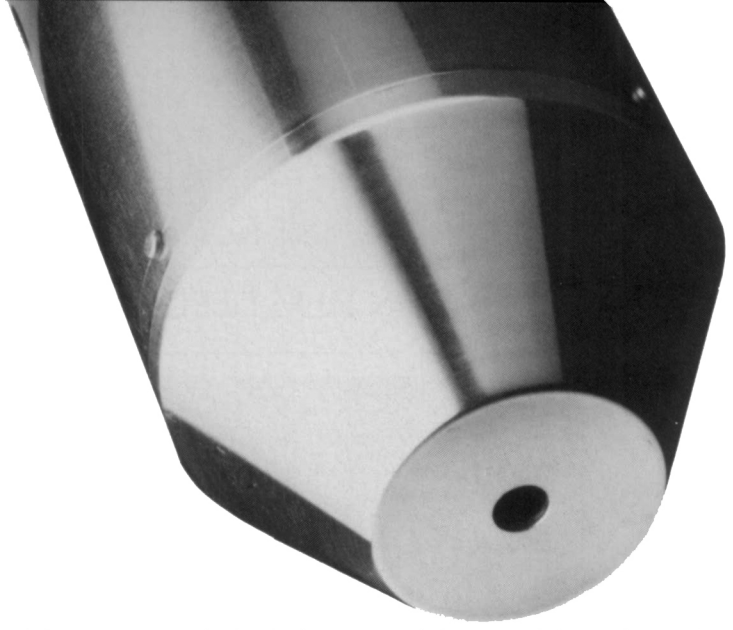

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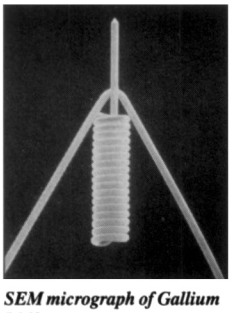

SEM micrograph of Gallium LMI source.

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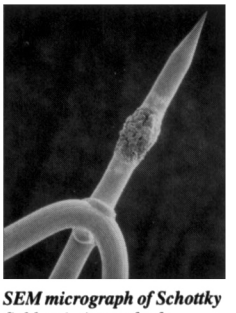

SEM micrograph of Schottky field emission cathode.

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Workshop Spawns Rocky Mountain Alliance for Superconductivity

Several regional organizations, including Los Alamos National Laboratory, have formed the Rocky Mountain Superconductivity Alliance. The idea for the alliance resulted from an informal workshop organized by Robert McConnell and Dana Moran of the Solar Energy Research Institute (SERI), Golden, Colorado, and Gene Stark of Los Alamos' Superconductivity Pilot Center.

Chaired by McConnell, the alliance will encourage joint research via a monthly newsletter that will help build a research network, identify areas of collaboration, and highlight specific members. It will also produce an "infrastructure directory" listing resources of the members. Ranging in size from large organizations to a two-person company, members of the new alliance include universities, private companies and research institutions in New Mexico, Colorado, and Nebraska.

Workshop participants favored an alliance because it is relatively easy to organize, does not require the legal and financial support of a consortium, and allows the formation of relationships between two or more members.

The August workshop included formal presentations by Rod Quinn, director, Exploratory Research and Development Center, Los Alamos National Laboratory; Robert Kamper, director, Boulder Laboratories, National Institute of Standards and Technology; John Trefny, Colorado School of Mines; David Ginley, Sandia National Laboratories; McConnell of SERI; and Allen Hermann, co-discover of the thallium-based superconductor compounds. Other participants who gave overviews of their research included Martin Marietta, Superconductive Technologies Inc., Ball Aerospace Systems, Colorado State University and the University of Colorado in Colorado Springs.

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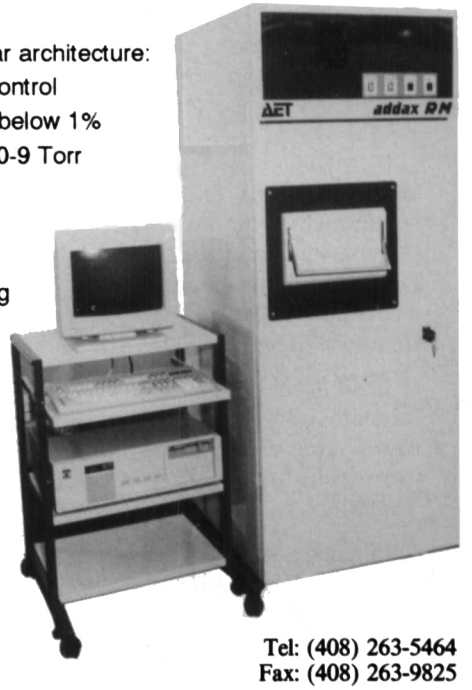

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R.S. Gordon Appointed Head of Materials Engineering at Virginia Polytech

Ronald S. Gordon was appointed department head and professor of materials engineering at Virginia Polytechnical Institute and State University effective July 1, 1989. Gordon has 25 years of experience in education, research and development, and industrial management in the field of ceramic materials, and has been principal investigator on nearly $10 million of research and development programs. He was also co-founder and chief executive officer of Ceramatec.

Gordon received BS and MS degrees in chemical engineering from the University of California (Berkeley) and the ScD degree from the Massachusetts Institute of Technology. A fellow and member of the American Ceramic Society, Gordon also holds memberships in The Electrochemical Society, National Institute of Ceramic Engineers, Ceramic Educational Council, and the Materials Research Society. His research interests include ceramic materials processing and characterization of synthesis and characterization of powders, solid state thermodynamics and electrochemistry, high temperature mechanical properties of ceramics, ceramic ionic conductors and ceramic superconductors.

Spanish Polymer Group Established

The Spanish Polymer Group (included in the Spanish Royal Society of Chemistry) held its founding meeting June 27, 1989 in Valencia, Spain, with more than 150 scientists and engineers in attendance. The group was founded to bring together scientists and engineers working in all the different areas of the polymer field in Spain and also to provide a means for them to cooperate with similar organizations worldwide.

The inaugural session began with remarks from Group President Dr. Arturo Horta (UNED) followed by presentations from Dr. Barrales Rienda (CSIC) and Dr. Marquez (Repsol Química) on the status of polymer science and technology in Spain. The Spanish Polymer Group concluded their inaugural meeting by selecting council officers.

J.J. Freire

Bill Giessen to Receive TMS Hume-Rothery Award

Bill C. Giessen, professor in the Department of Chemistry and Mechanical Engineering, Northeastern University, and also associate director of the Barnett Institute of Chemical Analysis and Materials Science, has been selected to receive the William Hume-Rothery Award of The Minerals, Metals & Materials Society (TMS).

The award is presented annually to an outstanding scientific leader for scholarly

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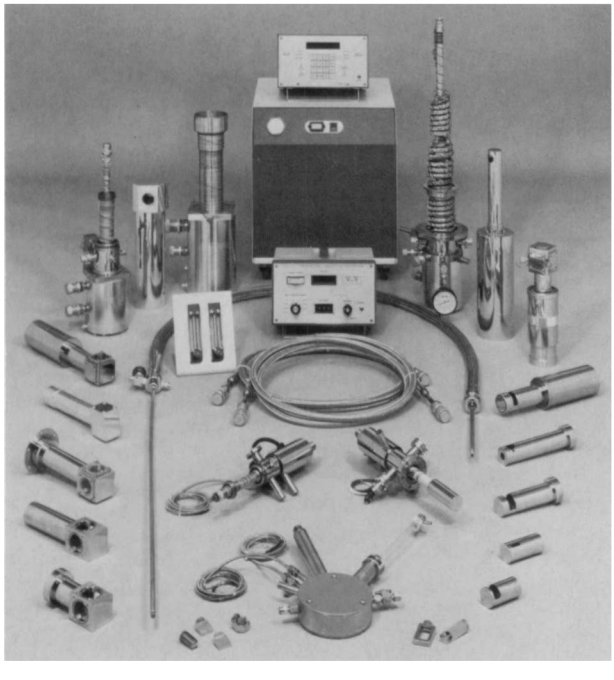

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contributions to the science of alloys. Giessen is being honored for "experimental and scholarly contributions to the understanding of metallic glasses, alloying behavior and crystal chemistry of metastable crystalline phases, and alloy phase equilibria."

Author or co-author of 180 publications and editor of seven books, Giessen also holds 10 patents in alloy chemistry, high temperature alloy phase diagrams, close-packed polytype phases, and metastable alloy phases produced by rapid solidification and metallic gasses. His current research involves the synthesis of high temperature superconductors from metal precursors. A member of the Materials Research Society, he has also co-chaired several MRS symposia on alloy phase diagrams and rapidly solidified metastable materials and alloys.

NAE Award Recognizes Creators of Integrated Circuit

The National Academy of Engineering has awarded the first international Charles Stark Draper Prize to Jack S. Kilby and Robert N. Noyce, recognized as independent co-inventors of the monolithic integrated circuit. The NAE is also honoring them for their separate work in bringing the integrated circuit into successful commercial production and application in commercial products. Kilby and Noyce will each receive a gold medal and will share the $350,000 cash award.

Kilby led the development of the first computer that used integrated circuits and also the development of a family of integrated circuits for the improved Minuteman missile. He co-invented the handheld solid-state calculator and invented the semiconductor gate array. His efforts helped establish Texas Instruments as one of the world's largest manufacturers of integrated circuits. Kilby is currently an independent consultant in Dallas, Texas and chief technical officer for the Houston Area Research Center.

Noyce co-founded Fairchild Semiconductor in 1957, which provided integrated circuits to NASA for the Gemini space capsule's onboard computer. In 1968 he co-founded Intel Corp., the first company to produce high-density memory components and microprocessors. The current president and chief executive officer of Sematech, Austin, Texas, Noyce is the Plenary Speaker at the 1989 MRS Fall Meeting in Boston.

The Draper Prize, to be awarded every two years, honors individuals who have contributed significantly to the advancement of engineering and whose achieve-

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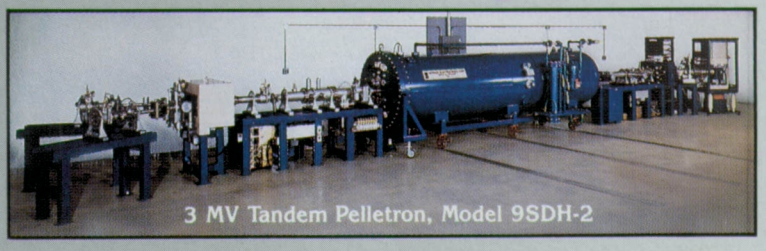

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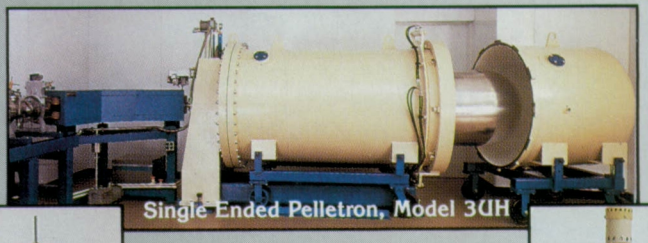

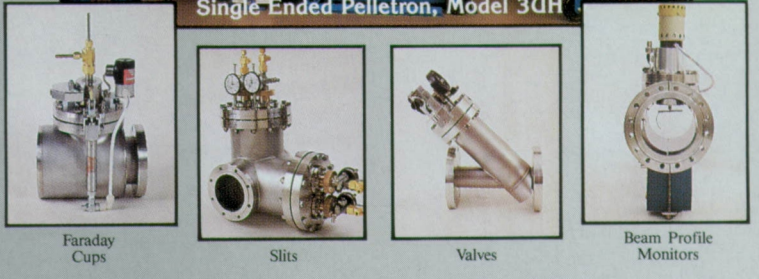

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Project to Probe Vitrification of Municipal Waste for Construction

In a $1.2 million program, the American Society of Mechanical Engineers and the U.S. Bureau of Mines will study whether residue from the burning of municipal waste can be fused into a glassy material, usable in construction.

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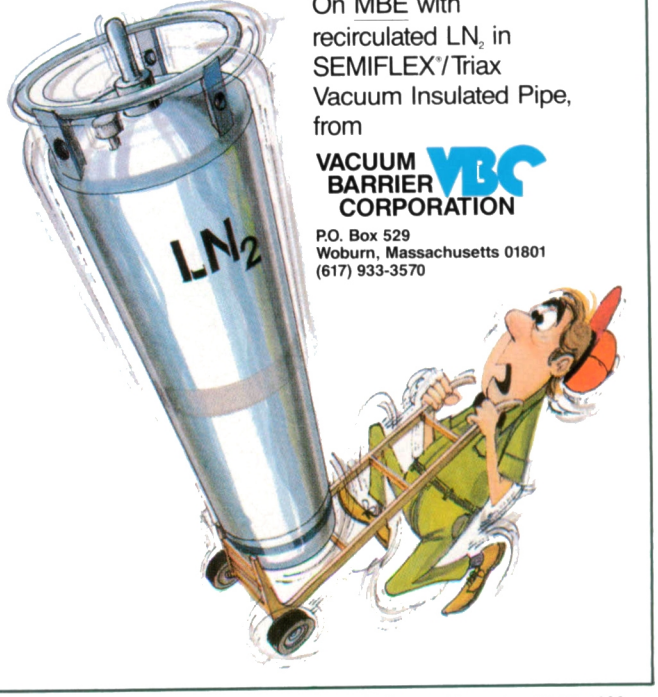

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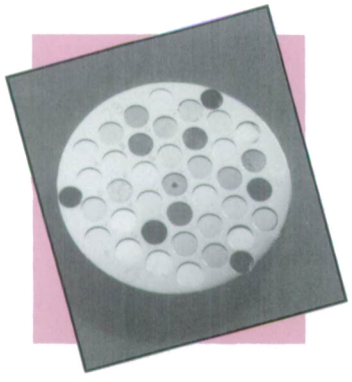

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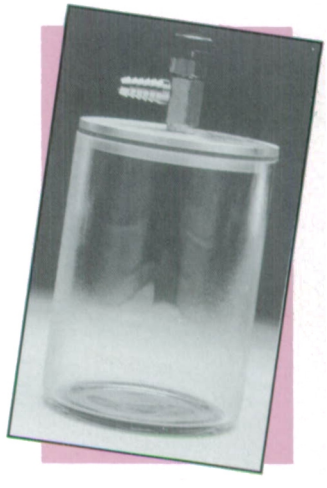

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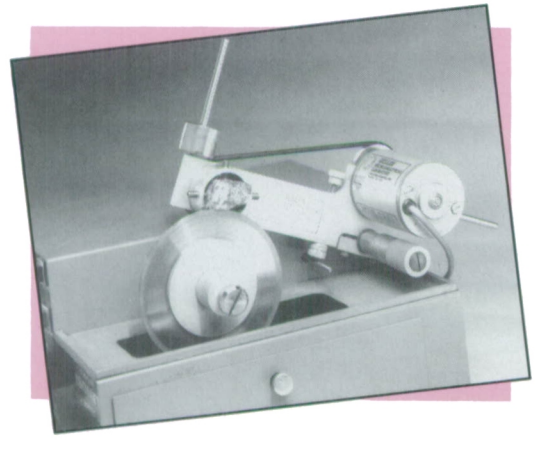

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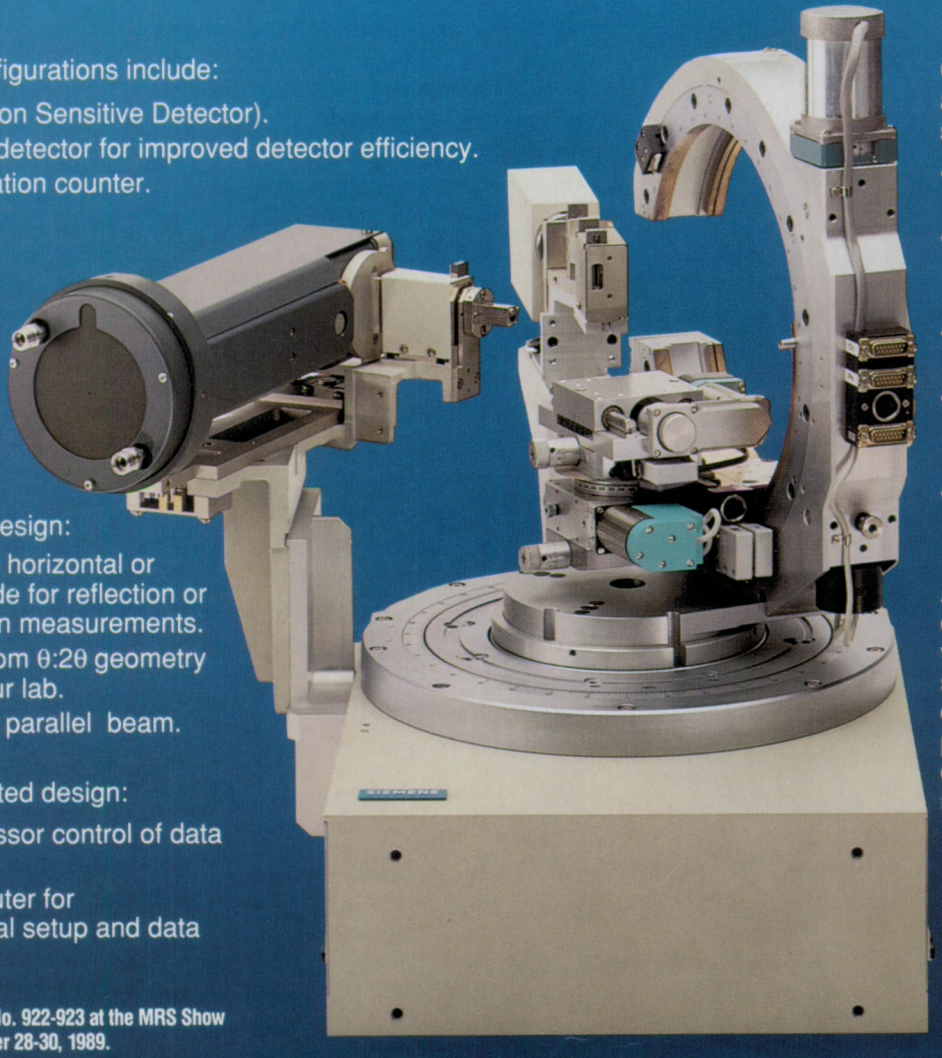

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Municipal Wastes. "Towns and cities would especially welcome a commercially competitive treatment methodology that could not only reduce the volume of residue, but also convert it into a marketable product." Vitrification, which immobilizes toxic materials in the residue, holds promise for accomplishing all these goals.

According to program co-director Herbert I. Hollander, an independent consultant, the research project seeks to determine the technical, environmental, managerial and economic feasibility of vitrifying the residue from different sources, including combined grate and fly-ash or fly-ash alone. By testing samples of residue from seven to ten municipal waste combustion facilities the researchers hope to:

- Confirm that the glasslike product is environmentally benign, is denser than the original residue, and takes less energy to produce than is recovered from burning municipal waste;
- Determine the optimal conditions and operating constraints for running an electric arc furnace to vitrify combustion residue, either continuously or during off-peak power periods;
- Identify beneficial uses for vitrified residue, potential markets and potential limitations on the product's use; and
- Identify the amount and nature of any residual material, emission, or effluent.

Acting through the Research Committee, ASME's Center for Research and Technology Development will serve as overall research manager of the program. Laboratory studies will be carried out by the U.S. Bureau of Mines at its Albany, Oregon Research Center.

Existing municipal waste combustion facilities, representing all major waste combustion technologies, are being identified and reviewed as sources of residue samples for the studies. A 35-ton sample from each site will be dried (after large metal pieces are removed) and shipped to Albany, Oregon for testing. □

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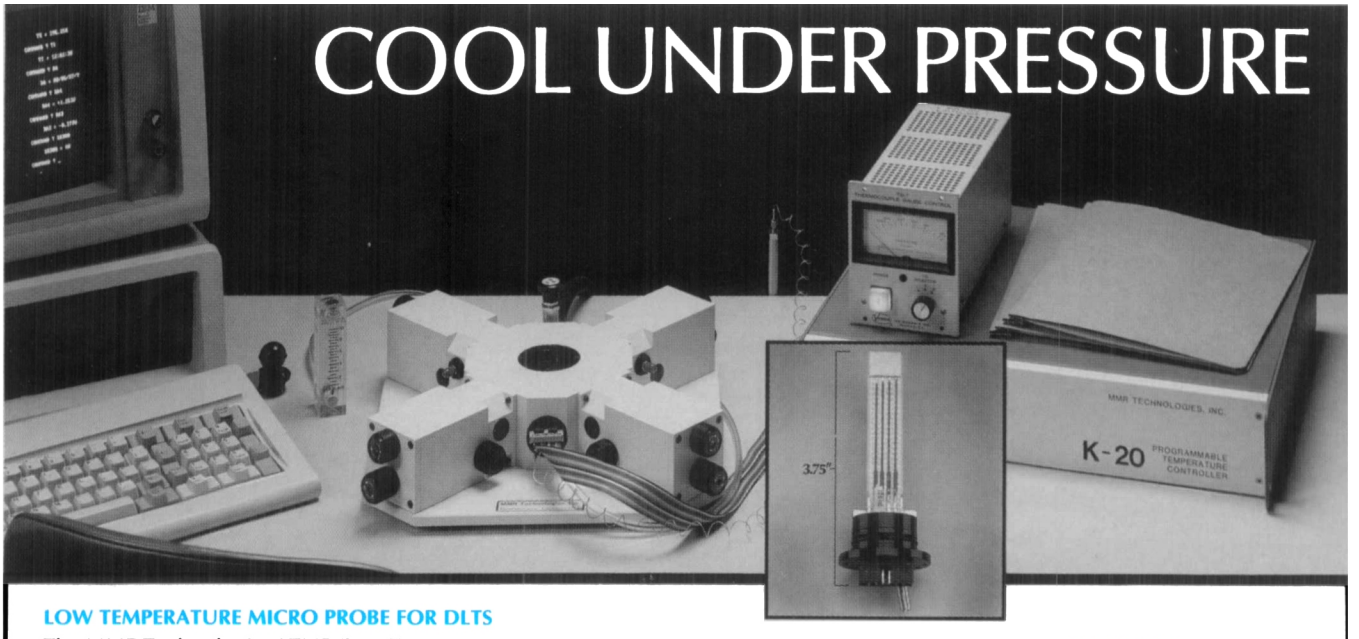

LOW TEMPERATURE MICRO PROBE FOR DLTS

The MMR Technologies LTMP (Low Temperature Micro Probe) is designed to provide cryogenic measurements – **without** the use of liquid nitrogen – of semiconductor materials such as gallium arsenide, mercury cadmium telluride and amorphous silicon. When integrated with the MMR Technologies K-20 Programmable Temperature Controller, the LTMP will provide controlled cycling and temperature measurement over a temperature range from 80K to 400K.

Features:

- Frost-free windows and samples
- Noise-free operation – operates without microphonics
- Temperature stability ± .05K
- Temperature accuracy ±0.5K
- Temperature resolution .01K
- Computer interface through IEEE-488 (GPIA) and RS-232
- Selective cooling – only the sample is cooled, not the enclosure

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