Report Surveys Latest Superconductivity Developments in Japan

High Temperature Superconducting Materials: The Current Situation, a Japan Materials Report, published by ASM International, provides a worldwide perspective to current scientific and policy developments in Japan. Scientific, engineering, and technical information includes detailed presentations of crystallographic structures, micrographs, graphs, and tables. Policy topics cover such areas as the way Japanese governmental agencies influence the direction of materials research, their projections for materials usage and policies toward rare earths, what direction Japanese efforts for commercializing superconducting materials are taking (including time lines), and the Japanese perception of efforts in the United States and the Soviet Union.

Japan Materials Reports are complied by the Japan Technical Information Service for ASM International. Information for these reports is gathered from such sources as proprietary research, technical papers presented at meetings not attended by Western scientists, never-translated proceedings of Japanese technical conferences, Japanese government documents, and items carried in Japanese language technical and trade publications.

For information, contact ASM International, Metals Park, OH 44073; telephone (216) 338-5151.

Frederick Lange Receives Jeppson Medal and Award from American Ceramic Society

Frederick F. Lange received the American Ceramic Society's John Jeppson Medal and Award during cermonies in conjunction with the ACerS 90th Annual Meeting held May 1-5 in Cincinnati, Ohio. The award was presented "In recognition of significant contributions to the understanding of basic mechanisms in the processing and mechanical properties areas, through innovative processing."

Lange is a professor in the Departments of Materials and of Chemical and Nuclear Engineering at the University of California, Santa Barbara. His career includes postdoctoral work at the Atomic Energy Research Establishment in Harwell, England, and various positions with Westinghouse Research and Development Laboratories and Rockwell International Science Center.

Lange is a Fellow of the American Ceramic Society and a member of the Materials Research Society and a Principal Editor for *Journal of Materials Research*.

D.E. Clark Named Fellow of the American Ceramic Society, Will Chair Engineering Ceramics Division

David E. Clark was named a Fellow of the American Ceramic Society during cermonies held in conjunction with the ACerS 90th Annual Meeting, May 1-5, in Cincinnati, Ohio. He was also installed as chair of the ACerS Engineering Ceramics Division.

Clark, a professor in the Department of Materials Science and Engineering, University of Florida, Gainesville, has been on the faculty there since 1978. His areas of specialization include materials engineering, ceramics, composites, glass, environmental degredation of glass and ceramics, coatings, and nuclear waste materials.

A member of the Materials Research Society, Clark was most recently a meeting chair for the 1988 MRS Spring Meeting in Reno. He has also been one of the symposium organizers and proceedings coeditors for three MRS symposia on Better Ceramics Through Chemistry.

11 Superconductivity S&T Center Proposals Submitted to NSF

According to *Superconductor Week* (March 14, 1988, p. 1), 11 proposals specifically concentrating on high T_c superconductivity research have been submitted to the National Science Foundation as part of its Science and Technology (S&T) Centers program. NSF hopes to fund 15-20 proposals at a level of $500,000 to $5 million annually, acccording to NSF's William Harris.

Superconductor Week identified the sources of eight of the proposals: Northeastern University, State University of New York at Buffalo, University of California at San Diego, University of Houston, University of Illinois at Urbana-Champaign, University of Maryland, University of Minnesota, and University of Wisconsin at Madison.

Many of the proposals include partnerships with other universities and with industry and the national laboratories. The University of Houston proposal includes support from Lawrence Berkeley Laboratory and the University of California at Berkeley. The University of Illinois proposal includes Argonne National Laboratory, Northwestern University, and the University of Chicago as partners.

The most interaction would come from the proposal submitted by the Massachusetts-based Northeastern University, which would be the focal point for a center encompassing the entire New England area and beyond. The proposal covers both conventional and high temperature superconductivity, and encourages all colleges and universities, and also many interested businesses, to participate.

The SUNY-Buffalo proposal, which includes SUNY-Stony Brook, Rensselaer Polytechnic Institute and Alfred University, mentioned that it has already obtained $5 million from the state of New York in addition to the promise of 10 tenure track positions at SUNY-Buffalo from the state.

NSF officials will do site visits of potential candidates this summer. If funds are appropriated by Congress for the program, final decisions will be announced in October or November.

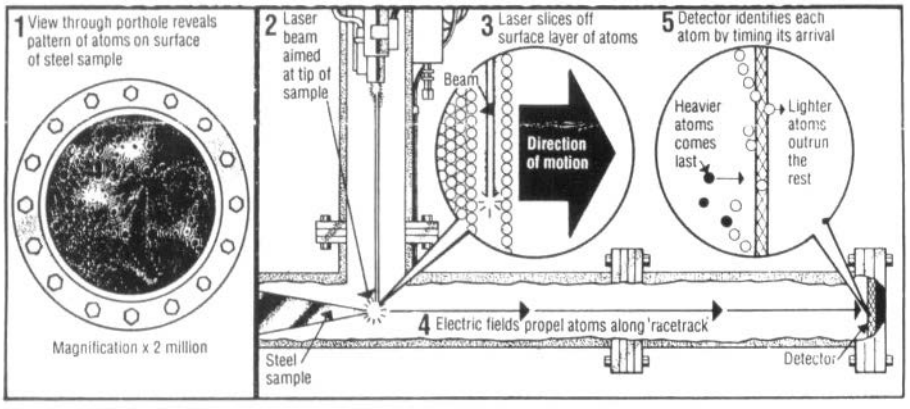
Ion Dry Etch Process Improves Semiconductor Fabrication

Sandia National Laboratories researchers have developed a technique that promises to improve control of compound semiconductor fabrication technology. The technique, ion-damage-controlled photochemical dry etching, uses accelerated ions to change the electronic behavior of selected areas on a semiconductor so the areas act as a "mask" for photochemical etching. The result of a group effort by Carol I.H. Ashby, David R. Myers, and Frederick L. Vook, the process is an advancement of the basic dry photochemical etching technique previously developed by Ashby and James Dishman.

The mask becomes part of the semiconductor wafer, so it cannot change position during fabrication, as can happen with conventional photolithographic technologies. The technique also reduces the need for multiple masks by exploiting the chemical effects of an initial ion implantation. Since ion implantation is already an essential processing step for many devices, using the technique as an integral part of the processing should reduce the number of steps needed to prepare complicated circuits.

Clarification:

An article in the February 1988 issue of the MRS BULLETIN (p. 12) on a new National Research Council study on beryllium supply incorrectly implied that federal action was pending against the nation's only supplier of beryllium. According to the company, modifications have been made to its facilities and processes in the past several years to bring the plant into compliance with Occupational Safety and Health Administration regulations. (Article and clarification partly reprinted from the National Research Council *News Report*.)



The Position Sensitive Atom Probe (PoSAP), a combination field-ion microscope and mass spectrometer, can detach a single layer of atoms from a material and analyze them simultaneously. Used in conjunction with computer mapping, the probe allows three-dimensional reconstruction of a specimen's atomic chemistry.

Oxford University Makes Breakthrough in Atom Probe Research

Scientists at Oxford University's (U.K.) Metallurgy Department can now reconstruct the atomic chemistry of a specimen in three dimensions by using computer mapping and a new atom probe/analyzer developed by Dr. George Smith, Dr. Alfred Cerezo, and Mr. Terry Godfrey. The Position Sensitive Atom Probe (PoSAP), a combination field-ion microscope and mass spectrometer, can detach a single layer of atoms from a material and analyze them simultaneously.

Smith, head of the team that developed PoSAP, said, "It will give us a new understanding of the composition of the new 'warm' superconductors, how a minute trace of molybdenum can transform the properties of a steel, and why metals become brittle when exposed to radiation."

A mass spectrometer is connected to the field-ion microscope via a pinhole-sized aperture to make an "atom probe." A pulse of electricity or laser light is aimed at the tip of a needle of material and individual atoms on its surface are torn off and propelled through the mass spectrometer. This identifies an atom on a given region of the tip by timing its flight to a detector. Atoms of the lightest elements arrive first, the heaviest last.

Atoms streaming off the specimen can be mapped in three dimensions by computer as successive layers of atoms are peeled off the tip. Fifty pulses are applied to the specimen every second, and the atoms are analyzed by detectors contained in three small boxes.

Using their one-dimensional atom probe, the Oxford team has come up with an improved steel for prestressed concrete, studied the way industrial catalysts work, cut the cost of processing a nickel turbine alloy, and has shown how trace impurities can affect steels used in nuclear reactors.

VG Scientific, a British company, will manufacture the new atom probe.

Oxygen Isotope Exchange Experiments Lower Superconductivity Temperature

A team of Los Alamos National Laboratory scientists led by chemist Kevin Ott has announced that a change in the type of oxygen isotopes used in a superconducting material can affect the temperature at which the material will conduct electricity. Experiments substituting oxygen-16 with "heavier" oxygen-18 caused a drop in the critical temperature of 33 K (60°F) and caused the material to begin conducting electricity at 59 K (-355°F). The superconducting material was a yttrium, barium and copper compound.

"I believe the key to our success was that when we built the lattices, we did not use a gas-phase exchange process," said Ott. "We dissolved the metals in oxygen-18 nitric acid and then processed them into a material containing heavier oxygen isotopes," he continued. Placing the oxygen with the metals in the material from the beginning assured that the oxygen was thoroughly integrated throughout the compound. Gas-phase exchange allows fewer of the oxygen atoms to permeate the material.

Ott affirmed the discovery by preparing six more samples with oxygen-18 and experimenting with them. He also experimented with oxygen-17 samples to verify his results. Even though these experiments illustrate a drop, not an increase, in superconductivity temperature, the isotope exchange results are expected to advance the understanding of superconducting materials.

Coors Ceramics Offers Internship Program

Coors Ceramics Company, Golden, Colorado, initiated an internship program in early 1987 to foster positive interaction and exchange of knowledge and expertise between the ceramic industry and the educational sector. Schools presently participating in the internship program include Alfred University, Ohio State University, Pennsylvania State University, Rutgers University, University of Illinois, and University of Missouri/Rolla. Six students, one from each university, will be selected for internship positions at Coors Ceramics in Golden, Colorado. The positions will include work on applications of technical ceramics in such markets as electronics, power, telecommunications, automotive, and aerospace. MRS