ASTM to Develop Standards for Nonmetallic Materials Test Reporting

The American Society for Testing and Materials (ASTM) standards writing Committee E-49 on Computerization of Materials Property Data has begun to develop new standards for reporting test results of nonmetallic materials. The standards will focus on reporting mechanical, physical, and other testing of ceramics, polymers, and composites. Efforts will concentrate on identifying all parameters needed to characterize a given test, and the best format to be used in reporting that information.

New task groups have been set up for these materials classes and will meet in Toronto, Ontario on October 12-13, 1988 and in Atlanta, Georgia on April 18-20, 1989. Persons interested in participating should contact the following: Ceramics—Camden R. Hubbard, National Bureau of Standards (301) 975-6121; Polymers—Liqaya S. Petrisko, Dow Chemical Company (517) 636-1245; and Composites—Darrell H. Reneker, National Bureau of Standards (301) 921-3344.

Since its 1986 inception, E-49 has been developing standards to make the compilation of materials databases easier. Draft standards are now being voted on for alloys, ceramics, polymers, and composites. Additional information on the activities of Committee E-49 is available from Chairman John Rumble, National Bureau of Standards (301) 975-2203; or from Don Viall, ASTM (215) 299-5546.

Indiana University Dedicates New Cyclotron "Cooler Ring"

A newly completed accelerator "cooler ring" was praised by public officials during its dedication ceremonies at the Indiana University Cyclotron Facility (IUCF) in Bloomington, Indiana on June 2. To be used in ultrahigh precision experiments, the National Science Foundation-funded "cooler ring" provides a means for testing unproven theories in nuclear physics. The project was conceived by Robert Pollock, an accelerator scientist and Distinguished Professor of Physics at Indiana University.

The afternoon dedication of the IUCF followed a symposium that began the previous day, in which scientists from the United States and abroad discussed the future of nuclear physics research. Dedication speakers included: Indiana Governor Robert Orr, NSF deputy director John H. Moore, and Thomas Ehrlich, the president of Indiana University, who gave the dedication address.

The cooler, a ring-shaped six-sided device, 285 feet in circumference, performs three essential functions: beam storage, cooling, and acceleration. The cooler stores pulses of nuclei from the main cyclotron, permitting the cyclotron beam to be used simultaneously for other experiments. The ring "cools" a stored beam by bathing it in an intense beam of electrons with uniform energies. The velocity or energy spread of the stored beam is reduced to as little as one part in 100,000 through interaction with the monoenergetic electron beam. This cooling and "sharpening" of the beam energy will enable physicists to observe nuclear interactions that occur only within a narrow energy range and that have not been detected with less sensitive equipment. For example, experiments will be performed to search for the elusive dibaryon, a subatomic, exotic form of matter consisting of six quarks. Though never observed, dibaryons are predicted by a number of current theories. Experiments have already begun to study the production of pions.

In addition to storing and cooling the beam, the cooler can accelerate the beam to energies two-and-one-half times higher than was previously available at the IUCF. Protons, for example, can be accelerated to energies of 500 million electron volts. The combination of high energy with such a low energy spread makes the IUCF cooler beam unique worldwide for nuclear studies.

The IUCF has a staff of 150, including faculty, research associates, students, engineers, technicians, and other professionals. In addition, about 250 scientists use this national facility.

The National Science Foundation has supported the IUCF since 1971. The facility became operational in 1976 and was completed with NSF grants totaling $5.9 million and state funds totaling $3.9 million. Construction costs for the cooler were about $6.6 million. The NSF operating budget for the IUCF is $8 million for fiscal 1988.

NRC Report Cites Role of Chemical Engineering in U.S. Industrial Success

A new National Research Council report says chemical engineering will play an increasingly important role in U.S. industrial success as a result of the profession's central involvement in the development of new molecule-based technologies. Specifically mentioned are frontier chemical engineering research developments potentially leading to smaller, faster computer chips; sophisticated chemical sensors on a simple microchip; and "ultrapure" pharmaceuticals, fuels, and other chemical products.

Eight high-priority research areas were identified in the report as being worthy of additional private, academic, and federal education and funding. Three of these areas relate specifically to materials technology:

- Microstructural Materials—ceramics, polymers, and composite materials with designed structures at the molecular and microscopic level to achieve desired performance. Especially relevant will be chemical methods of synthesizing complex materials, often using adhesion and molecular self-assembly techniques.
- Advanced Computational Methods and Process Control—computational tools, especially those involving computer modeling of design and processing of chemical products. Better computer control of processes alone could save billions of dollars, notes the report.
- Surface and Interfacial Engineering—continued exploration of the full range of properties and structures of surfaces and interfaces. Particular attention, said the report, should be given to chemical and physical changes that occur at phase boundaries (between gas and liquid, for instance) and to developing models that predict surface chemical reactions.

The other priority research areas identified were biotechnology and biomedicine; electronic, photonic, and recording materials and devices; on-site processing of resources; liquid fuels; and hazardous substances management.

The study committee called for a one-time expansion of chemical engineering university faculties over the next five years. The chemical industry, with a 1986 trade surplus of nearly $8 billion, is currently one of the few successful U.S. industries in world competition. Closer partnerships between the academic and industrial communities are needed to support research in chemical engineering and bring it to speedier commercialization, the report notes. The committee also urged the federal government and the chemical processing industry to increase funding in chemical engineering areas.

The three-year Research Council study was funded by the Department of Energy, National Bureau of Standards, National Science Foundation, Whitaker Foundation, American Chemical Society, American Institute of Chemical Engineers, and Council for Chemical Research, Inc. Neal Amundson, Senior Vice President for Academic Affairs and Provost of the University of Houston, chaired the committee of 32 corporate, academic, and government scientists and engineers.

Copies of the report, *Frontiers in Chemical Engineering: Research Needs and Opportunities,* are available from the National Academy Press, 2101 Constitution Avenue NW, Washington, DC 20418; telephone (202) 334-3313.

U.K.'s LINK Program Promotes University/Industry Science

The government of the United Kingdom is promoting LINK, its program which encourages scientific collaboration between industry and universities. Over the next five years, this joint program is expected to attract approximately £420M in funding from industry and government sources. Five program areas of research have already been announced. Among them are:

Molecular Electronics—with emphasis on materials with potential electronic applications. Proposed budget is £20M.

Advanced Semiconductor Materials—intended to improve, through better fabrication methods, the performance of materials and devices used in optoelectronics and microelectronics, particularly in silicon and in multilayer structures. Funding is £24M.

Nanotechnology—a £12M program, dealing with new technologies for positioning, machining, controlling, and measuring to an accuracy of 1 nm.

These research areas are variously supported by assistance from industry, the Department of Trade and Industry (DTI), and the Science Engineering Research Council (SERC).

I.W.B.

[Editor's Note: See the MRS Bulletin, Vol. XII No. 2 (1987) p. 8 for an article announcing the LINK initiative.]

Coors and CSM Form Advanced Ceramics Center

Coors Ceramics Company and the Colorado School of Mines (CSM) have established a multimillion dollar program of research and graduate education in the fields of advanced ceramics and composite materials. It consists of a new industry/university research center and a $2 million professorship.

The research center, the Colorado Center for Advanced Ceramics, is intended to improve technology transfer in these fast-paced fields and to foster continued growth of advanced materials companies in Colorado. The center differs from traditional industry/university ventures in that it emphasizes collaborative research from both organizations.

In conjunction with the center, the school has also established the Herman F. Coors Chaired Professorship in Ceramics. A gift from Mrs. Janet Coors, wife of the late Herman Coors, the endowment creates one of the largest fully endowed academic chairs in Colorado. According to George S. Ansell, president of the Colorado School of Mines, "Not only will this professorship help strengthen the center and the school, it will help position the state as a viable force in the ceramics field." The school is conducting an international search for a distinguished scientist to fill the position.

David Wirth, vice president of technical operations at Coors Ceramics Company, will serve as director of the center and as a CSM faculty member. The center will be initially staffed by approximately 22 individuals, including Coors Ceramics Company employees; CSM faculty from the departments of chemistry, metallurgy, engineering, and physics; and graduate students. That number is expected to reach 70 within the next five years as center operations grow into a $15 million investment.

Though the Center will initially involve only Coors Ceramics Company and CSM, Ansell said he expects other companies and universities with interests in advanced materials will join. The Colorado Center for Advanced Ceramics will operate from the CSM campus.

Los Alamos and Grumman to Develop Ground Test Accelerator

Los Alamos National Laboratory and Grumman Corporation have agreed upon a partnership to develop a key component of the Strategic Defense Initiative. They have signed a three-year, $15 million contract to jointly develop a state-of-the-art ground test accelerator at Los Alamos. It will generate powerful neutral particle beams able to discriminate between real enemy warheads and decoys as they head towards the United States. These same beams may also be used as a weapon to kill missile boosters and warheads.

"We believe collaborations like this will be the way similarly large projects may be handled in the future," said Walter Reichelt of the laboratory's Defense Research and Applications Directorate. "Technology transfers or exchanges like this offer mutual benefits to everyone involved."

The Ground Test Accelerator Facility, a 67,700 ft² building that will house the neutral particle beam generator, is now under construction at Los Alamos. It is scheduled to be completed in 1989. Work will then begin on installing and testing the components, including special equipment to funnel several medium-strength particle beams into one 100-million electron-volt beam, the most intense ever produced. The beam will be focused by a first-of-its-kind magnetic telescope. A scale model of this telescope is now being tested at Argonne National Laboratory, near Chicago. The initial three-year contract between Los Alamos and Grumman has an option for renewal, which will be considered in 1990.

Penn State's Center for Advanced Materials Receives NASA Award

Pennsylvania State University's Center for Advanced Materials in the College of Earth and Mineral Sciences has received a $2.3 million, five-year award from NASA. The award is earmarked for research leading to the development of new high-performance materials for use in aircraft engines of the 21st century. The long-term cooperative agreement with NASA's Materials and Structures Division is to promote

development of the fundamental technology needed for materials in high-temperature situations. This is the second major multimillion dollar award made to Penn State by NASA in the past month.

"Essentially, we will be creating the engineering and scientific base needed to invent new materials," said Richard E. Tressler, director of the Center for Advanced Materials. In a five-year program of fundamental research, materials scientists and engineers at the Center for Advanced Materials will select the most appropriate combination of components for new composites which are expected to be fiber reinforced and combine the properties of metallic, intermetallic, and ceramic materials.

The researchers will focus on developing new low-density fibers that can withstand very high temperatures, investigate both the micromechanics and the macromechanics of the composite, and study the character and behavior at the interfaces between the ceramic and metallic components of the material. They will also decide on the best techniques for processing and fabricating them.

The work will involve theoretical and experimental investigations and modeling studies carried out by a team of scientists and engineers from the center, the Department of Materials Science and Engineering in the College of Earth and Mineral Sciences, and the Department of Engineering Science and Mechanics in the College of Engineering. Individual technical components of the project will be led by Tressler, John R. Hellmann, and H. Thomas Hahn.

National Superconducting Cyclotron Lab Now Ready at Michigan State

The new National Science Foundation-funded National Superconducting Cyclotron Laboratory at Michigan State University (MSU) in East Lansing is now ready to provide the experimental capability to collide the nuclear cores of the heaviest atoms with an unprecedented combination of violence and precision. It is hoped that the results of these experiments will lead physicists to fundamental rules governing subatomic matter, and ultimately, to a better understanding of cosmic forces.

Scientists generated the K800 cyclotron's first high-energy beam in February 1988, using the superconducting magnet to accelerate electrically charged helium and carbon nuclei in a tight spiral. Within the seven-foot-diameter confines of the cyclotron's strong magnetic field, the nuclei travelled 1.9 miles and reached a speed in excess of 60,000 miles per second.

Early in June, for the first time, scientists succeeded in bending a narrow, high-energy beam of neon nuclei so that it exited the cyclotron cleanly within a single pass, crashing into a stainless steel target. The energy of the test beam was 360 million electron volts, and the machine is capable of accelerating nuclei to energies approaching eight billion electron volts. By comparison, the world's second most powerful heavy-ion cyclotron, GANIL in Caen, France, has accelerated beams to energies of 4 billion electron volts. Lighter nuclei travel faster than heavy nuclei of similar energy.

The success of this recently announced test means that precision beams of heavy nuclei can now be directed into laboratories at the facility for use in experiments.

"The K800 is unique for both the intensity and uniformity of the beam of nuclei it can generate," said Henry G. Blosser, who originated the superconducting accelerator concept and codirects the facility along with MSU physics professor Sam Austin. "The K800 can accelerate a beam of nuclei of even the heaviest naturally occurring element, uranium, to speeds that will lead to nuclear reactions that have never been observed before. It's like being able to accelerate cannon balls instead of BBs."

The National Science Foundation has supported cyclotron research at MSU since 1961. An NSF-funded K500 superconducting cyclotron, in operation since 1982, has now hosted more than 275 scientists from 47 institutions, who have conducted more than 120 experiments. Construction of the K800 began in 1980. The 1988 NSF operating budget for the laboratory is $7,100,000.

U.K.'s SERC Announces Interdisciplinary Research Centers at Universities

The Science and Engineering Research Council (SERC) in the United Kingdom, a main source of research funding for universities, introduced a new concept in research funding last year—Interdisciplinary Research Centers (IRCs). Four IRCs have been announced to date, with a fifth due to be approved shortly. The purpose of the IRCs is to identify areas of science where the skills from a variety of disciplines are brought together to create a collaborative environment. Researchers and engineers in the United Kingdom have traditionally tended to remain close to their classical subject origins, with intermixing notably limited.

The IRCs established so far are in Superconductivity (at Cambridge), Molecular Science (at Oxford), Surface Science (at Liverpool University), and Engineering Design (at Glasgow University). The fifth IRC on Semiconductor Growth Characterization and Processing is scheduled to start at the University of London early in 1989, with a budget of £10M.

Indicative of the government's commitment to this strategy, the SERC has invited bids from universities on six new IRCs. Suggested topics include: High Performance Materials, Optical and Laser Science and Technology, Surface Engineering, and Polymer Science and Technology. The SERC has requested extra money for these centers, with each expected to cost about £6M. Expected to be in place by the end of 1989, each center will contribute staff and financial support solicited from industry. The closing dates for bids on these new centers is mid-September.

I.W.B.

[Editor's Note: See the March 1988 MRS BULLETIN, p. 40, for some background on SERC's review of materials research support in the U.K.]

C.T. Liu to Receive E.O. Lawrence Award From DOE

C.T. Liu was among six scientists selected by the U.S. Department of Energy for the 1988 Ernest Orlando Lawrence Memorial Awards. Given for outstanding contributions in fields of science and engineering related to atomic energy, the awards include a citation, a medal, and $10,000.

Liu, a metallurgist at Oak Ridge National Laboratory, was recognized for his outstanding contributions to the establishment of scientific principles for the design of ordered intermetallic alloys, and for the successful application of those principles to the development of new alloy systems. A native of China, Dr. Liu is an undergraduate of the National Taiwan University and received his PhD in materials science and engineering from Brown University. He joined the Metals and Ceramics Division of Oak Ridge National Laboratories in 1967 and was recently promoted to the position of Corporate Research Fellow. He is a member of the Alloy Phase Committee of the American Institute of Metallurgical Engineering. He is also a member of the Materials Research Society and served as a meeting chair for the 1988 MRS Spring Meeting in Reno. □