

SUMMARIES OF SYMPOSIA AT 1978 ANNUAL MEETING

Symposium A: The Science Underlying Waste Management

G. J. McCarthy, Organizer

This symposium was the first ever to address the scientific basis of the treatment and isolation of the radioactive wastes produced by nuclear power plants and weapons establishments. More than 300 people from a dozen countries registered for this symposium and heard 78 papers from authorities from government, university and industry laboratories. Topics ranged from design of solid waste forms, its processing, its physical and chemical properties to the projected geologic stability of these forms, properties of suitable repository rock types, the movement of any released radionuclides through these rocks and the modeling of the total waste isolation system.

Symposium highlights include:

- . recognition of both the scientific basis and feasibility of producing high stability waste solids modeled after nature's proven durable minerals; it was announced that prototypes of these solids remain inert even in hot pressurized groundwaters,
- . demonstration of the rapid interaction of hot pressurized groundwaters and the leading waste solid, glass; however, canister corrosion studies under these same conditions suggest that glasses could be protected from these solutions for hundreds of years,
- . descriptions of actual radioactive waste disposal and future plans by workers from the USSR,
- . correlation of theory, lab tests and field tests on radionuclide movement in granite by Swedish scientists,
- . physical chemistry and thermally-induced migration of brines such as those that could occur near a geologic repository in salt,

- . modeling of the complete system of barriers that constitute nuclear waste isolation: the waste form; its container, engineered structures, deep rock formations.

Proceedings of the Symposium will be published by Plenum in the spring of 1980. Professor Gregory J. McCarthy of Penn State, who organized the program, will edit this volume. Plans are established to present this symposium again at the 1979 Annual Meeting and to continue the publication of the proceedings.

Symposium B: Materials Characterization in Archaeology, Historic Preservation and the Fine Arts

Wendell Williams, Organizer

Archaeologists and museum conservators face highly complex technical problems in characterizing and interpreting their historical materials. These problems were discussed in the company of materials scientists in a symposium entitled, "Materials Characterization in Archaeology, Historic Preservation and the Fine Arts."

Each of the three days of the symposium was devoted to a topical area: "Materials Problems in the Museum;" "Archaeological Dating," and "Early Materials Development." As these topics suggest, the audience consisted of a wide variety of specialists, including museum lab directors and professors of materials science. In all, twenty papers were given. Attendance reached a peak of 50 and never fell below 25. Although these numbers are small compared with attendance at the prominent and well-supported areas addressed by the other symposia at the meeting, the national pool of

such specialists is also small. Participants and audience were spirited throughout and generally felt that the symposium had fulfilled its purpose.

Publication of the papers presented as an educational package was considered and an offer was received from a journal in the field. However, the cost of publication was prohibitive.

The Council of the Society has agreed to consider presenting another symposium in 1981. Meanwhile, other technical societies are becoming interested in the same subject areas and will offer some opportunities for presentation of results.

Symposium F: In-Situ Composites

B. Oliver, Organizer

Research results on the international development of new high temperature Ni and Co based alloys for use in developing more efficient jet engines were presented and reviewed. Theoretical analyses that increase the understanding of the use and service of these unique materials and better and less expensive means of manufacturing them were also examined. Component development, stability at long times and high temperatures and related actual in-service test programs were presented and discussed.

Symposium G: Epitaxial Crystallization of Polymers and Oriented Polymerization

Eric Baer and J. B. Lando, Organizers

This symposium first dealt with the precise control of structure through solid state polymerization. It was pointed out that this method is currently the only known way to produce conducting polymers. The molecular engineering involved in monolayer polymerization was also discussed in

detail. Examples of the three types of topochemical solid state reactions were presented. Specifically, polyacetylene's reaction with ionic dopants to produce a conducting polymer, and the possible photoconducting properties of doped and undoped polydiacetylenes were discussed. The very slow polymerization of $\text{NiBr}_2 \cdot 2\text{CEPr}$ and related compounds allowed a precise diffraction determination of the mechanism of the surface nucleated reaction. The second session of the symposium dealt with the general topic of polymer epitaxy, from the melt and dilute solution, on both organic and inorganic substrates. The overview lecture emphasized the importance of epitaxy in controlling both morphology and structure via a variety of differing mechanisms. The novel development of polymer epitaxy on organic substrates through simultaneous melt crystallization was outlined, as well as the ability to obtain unusual polymorphic polymer forms on these substrates in the same manner as previously seen for epitaxy on alkali halides. Finally, the theoretical explanations for the observed morphology and structures of polymer epitaxy on alkali halides were discussed and provided further insight into the most important orientational force involved in the adsorption process.

Symposium H: Laser-Solid Interactions

H. Leamy and J. Poate, Organizers

The symposium features 92 presentations from an international cast of experts in the use of laser and electron beams to effect improvements in the near-surface region of both semiconducting and metallic materials. The symposium was attended by some 300 scientists, who represented 61 separate research organizations and 11 different countries.

The primary focus of the symposium was the application of laser radiation to anneal ion implantation damage in semiconductor single crystals. This topic, which has been the object of intense recent interest, was fully reviewed and expanded to include metal-silicon surface alloying, epitaxial growth of amorphous Si on crystalline substrates, and ohmic contact formation in both Si and GaAs. In addition, recent advances in laser transformation hardening, surface alloying, surface desensitization, laser assisted machining, and laser melt quenching of metallic alloys were discussed.

The proceedings of the symposium will be published by the American Institute of Physics as a volume in their Conference Proceedings Series, and will be available in early 1980.

ACCEPTANCE REMARKS FOR THE VON HIPPEL
AWARD OF THE MATERIALS RESEARCH SOCIETY,
BOSTON SHERATON HOTEL, BOSTON,
MASSACHUSETTS - NOVEMBER 30, 1978

W. O. Baker, President, Bell Laboratories

I am grateful for this occasion and to those who have created the Materials Research Society and, above all, to those whose work gives it meaning and content and continuity. A gathering like this puts people together so that we can see and say how human are science and engineering, how human is our striving to understand matter, and its coupling with the intangibles of the mind and spirit. To have been welcomed by my cherished colleague, Professor Rustum Roy, and then received by my esteemed associate, Ken Jackson, and his successor president, Rudy Voorhoeve, is for me a treasured experience.

Happily, adroitly, and artfully your group here, through your officers and committees, and program speakers and audiences, have combined these features in our context of today. Professor Arthur Robert von Hippel achieved his eighth decade of a distinguished life on November 19th. He joined the faculty at MIT some forty-two years ago, the year I began to study the dielectric properties of organic crystals in the early times of solid state science, at Princeton. This event is noted only because in the next year or two my first serious professional society affiliation came through the Conference on Electrical Insulation of the National Research Council, where Professor von Hippel's participation was already becoming prominent. By the time he was chairman of this activity of the National Academy of Sciences in 1952, he had already established his special cognition of the atomic and molecular role in the macroscopic properties of materials. This was later reflected in such important books as "Molecular Science and Molecular Engineering", 1959, and the "Molecular Designing of Materials and Devices", 1965. Thus, his pioneering conviction that the classic behavior of matter in bulk could be treated on an atomic and molecular scale was vital inspiration to many, including myself, in following up the studies of the electrical properties of matter and its chemical, physical, and mechanical manifestations. I had been led into this field by my teachers, first Smyth and then Debye, even before I was captivated just forty years ago this coming spring by macromolecules (polymers) as particularly large and convenient molecular handles on materials properties.

So you see, what an honor it is to have yet another association with Professor von Hippel, a legendary prophet in the realm of interdisciplinary science and technology.