MATERIALS RESEARCH SOCIETY - NEWSLETTER

MAY 1974 P. O. BOX 63, WEBSTER, NEW YORK 14580 VOL1/NO.1

Dear Member,

As many of you recall from my earlier correspondence, I said that as a completely volunteer organization the Materials Research Society would have many associated inefficiencies. This prediction has certainly been borne out by our rather modest start-up and gives greater creditability to my predictions than I care to have. The Society councillors and I are very appreciative of your patience.

We have had difficulty making the transition from an ad hoc founding group to an organizationally functioning society. We have not effectively tapped the potential resources offered by many of you who indicated interest in contributing activity. The council is establishing directions to enable local activity and contact and you will hear of it soon.

This is the first issue of the newsletter of the Materials Research Society. It is intended that the newsletter serve you in two ways. The first is to provide news about the Society and its interests. The second is to provide a forum for discussion of information and issues of generic interest to the materials community. This issue will include a leading materials scientists' view point of the need for this society, reports on membership and the first meeting sponsored by the society. This issue also includes a short article on a "Frontier of Materials Research" and announcements concerning future activities of the Society.

It is our hope that you will contribute to future letters through articles, announcements, and criticisms. In this letter of LOGO competition is announced for the suggestions of an official emblem for the Society. Please send your ideas.

Mark Myers, Secretary

REPORT ON THE SOCIETY

The first meeting sponsored by the Society, and supported financially by the Office of Naval Research, brought together some 200 scientists from all aspects of Materials Science.

The title of the conference was "Phase Transitions and Their Application in Materials Science". Subject matter was organized into general discussions of phase transition applications, definitions and terminology with the latter being very important because of the multi-material and discipline interests of the participants. Specific sessions concentrated on structure and lattice dynamics of phase transitions, optical applications, transitions involving changes in conductance, the glass transition, cooperative transitions in the solid state, transitions in macromolecular and biological systems, transport and kinetics, magnetic transitions and experimental techniques of observation. The proceedings edited by L. E. Cross, Chairman of the Conference have been published by Pergamon Press under the title "Phase Transitions 1973".

The Materials Research Society held its inaugural meeting on May 23, 1973 as part of the Phase Transition Conference. The Society's purposes as defined in its charter adopted at the 1973 meeting was stated as follows: "The Materials Research Society will serve and promote the common interests of those people involved in the preparation characterization, design and utilization of materials. Particular emphasis is placed on research activities involving the interfaces of many scientific and engineering disciplines. This is a professional society specifically designed to appeal to a community of scientists and engineers trained in a broad spectrum of fields; physics, metallurgy, electrical engineering, ceramics, chemistry, polymer science, engineering mechanics, chemical engineering, etc."

The slate of officers and councillors for the Society in the year 1974 were proposed and approved.

President: Harry Gatos, M.I.T.
Vice-President: Rustom Roy, Pennsylvania State Univ.
Secretary: Mark Myers, Xerox Corporation
Treasurer: Leonard Weisberg, Itek Corporation
News Letter Editor: Izzy Warshaw, N.S.F.

The Society Councillors for one year terms are:

E. Baer - Case Western Reserve
R. Huggins - Stanford University
E. Kay - I.B.M. Corporation
E. Parker - Univ. of California-Berkeley
K. Jackson - Bell Telephone Laboratories

And for two year terms are:

J. Tietjen - R.C.A. Laboratories
E. Petrie - Eastman Kodak Company
D. Stein - Univ. of Massachusetts
S. Radcliffe - Case Western Reserve Univ.
R. Laudise - Bell Telephone Laboratories

The present membership of the Society Stands at 215 members. A profile of their formal fields of training and present fields of interest shows the following distribution.

Field of Training	
Chem./Chem. Eng.	33%
Physics	22%
Ceramics	11%
Metallurgy	9%
Materials Science	8%
Mineralogy/Geo.	7%
Polymer Science	6%
Eng. (Mech./Elect)	4%
	100%

Field of Interest	
Polymers	23%
Ceramics	22%
Electronic, Opt. & Mag. Prop.	18%
Crystal Growth	15%
Inorg. Chem.	12%
Metallugry	7%
Mat'l. Characterizaton	2%
Mech. Prop.	1%
	100%

his membership represents the mailings in connection with the "Phase transition" Conference and is probably very dependent on the character of the initial mailing lists. It is expected that the profile will change after future mailings concerning different conferences.

GOOD GRIEF, NOT ANOTHER SOCIETY

Well might Charlie Brown explode at first exposure to the fact. But here in his own words is Linus' discerning reply.

The Materials Research Society is needed because there is already a large clearly identified group of scientists and engineers who regard their professional activity as Materials Research, and they need to communicate effectively with each other. The Materials Research Society is needed for the thousands of students who are being trained in a "Discipline" with that label.

Many of the readers of this newsletter may have forgotten, the youngest ones may not even have known, (and some of the 'oldtimers' would perhaps just as soon forget!), the fact that materials science and engineering, was and remains the prototype of major interdisciplinary activities within the whole spectrum of the scientific enterprise. The question could then be asked: What are the tangible results of the great flurry of activity, on the part of thousands of scientists and engineers and substantial investment of federal funds? We would hope that part of the reply could be, that out of all this, there appeared a new 'community' --- that group of engineers and scientists who perceive themselves professionally as 'materials scientists' or 'materials researchers'. The Materials Research Society is an essential communication vehicle for this community. Irrevocably now, there is launched all the apparatus and paraphernalia for a new subdivision of science and engineering. Funding agencies and industrial research laboratories have created new divisions of materials research, or science, or whatever. A half dozen new journals are already well established. Students are emerging from dozens of materials science and/or engineering departments in our universities. The *gemeinschaft* has been around for years, the *gesellschaft* has been overdue.

The society shares with a few others the problem that most of the practitioners of materials research are in fact members of other societies and all of them (except the youngest) started as professionals with other labels. The society is confronted therefore with the difficulty of requiring that new members alter or add to their existing allegiances. We therefore expect slow growth, but have little question that since the major goals and purposes of the society are shaped for the new (and coming) generations of materials researchers, the future is assured.

Since materials research is, by definition, interdisciplinary (in terms of present disciplines) it is clear that the Society's members will be drawn from all such disciplines. But materials research is also interdisciplinary in another dimension; it covers the total spectrum from basic science to engineering, from pure theory to real devices. Hence society activities should encourage and cater to interaction along this dimension. It goes without saying that the society is explicitly

concerned with all classes of technological materials: ceramics, metals, polymers, and electronic materials. Indeed the society plans to be involved only in activities which deal with general properties or principles cutting across the boundaries of single materials classes.

The activities of the society will include the usual ones. Sponsoring meetings and providing for the better communication among the members. It was the intention of the founders that meetings for the first few years should concentrate on many small highly focused gatherings carried out by volunteer groups of members in different parts of the country. Likewise, it was felt that there was no urgency in starting a new journal, instead the possibility of interacting with several existing Journals will be considered. The Society should become deeply involved in educational and professional matters at the national level.

Rustum Roy
Pennsylvania State University

FRONTIERS OF MATERIALS RESEARCH

Biomedical Polymers

We may define biomedical polymers in terms of polymeric materials used either within the body for prosthetic remedial purposes or outside of the body where physiological fluids or material are passed through or stored in contact with the polymer.

In terms of this broad definition, the demand for research in, and sale of biomedical polymers are each rapidly expanding. The challenges in design of suitable materials are also enormous. Apart from the normal design criteria of processability, mechanical properties, porosity, etc., we are faced with such problems as toxicity and biocompatability.

Initial efforts in implantable polymeric material date back to the late nineteenth century when celluloid was apparently the first polymer to be used. It was not however until the past few decades that polymers were used in any volume for biomedical purposes, but use of plastic for heart bypass systems, kidney dialysis membranes, blood storage, etc., has by now become commonplace. Despite the apparent suitability of plastics for such purposes, there are problems arising from the use of polymers which are not specifically designed for the biomedical purpose. For example most commercial polymers can, and do, initiate blood clotting by surface reaction, and the commonly used blood bag storage material polyvinyl chloride contains phthalate esters (plasticizers) which leach into the blood cells.

Evidently the problems of biocompatability become even more acute where implanted materials are ooncerned.

Over the past few years there has been a growing movement oriented in the direction of designing polymers specifically for biomedical purposes, particularly for implantation. There seems to be little doubt that surgery of the future will rely heavily upon the availability of replacement part most of which are "soft" and potentially of polymeric origin.

n terms of protheses and their design one has to first be aware of the features underlying biocompatability and this fact is increasingly drawing together plastics technologists, biochemists and medical researchers. Some of the problems to be overcome include immune response and rejection, toxicity, carcinogenesis, trauma (mechanical/irritant), non thrombogenicity, etc.

The approaches used to date are twofold - a) modification of existing materials and b) ab initio design of new ones. Just a few examples of methods will be mentioned here. In the first area one thrust has involved using available commercial polymers and rearranging their physical form and altering surface properties. For example connective tissue is more compatable with and adherent to, porous or "woven" material than solid sheets. As spelled out previously, most plastics are thrombogenic, i.e., they initiate blood clotting. As a countermove, attempts, in some cases relatively successful, have been made to bind anticoagulants e.g. heparin to the surface. Other sources of soft materials, this time biopolymers, include processed fibrin and fibrinogen from blood clots, modified collagen, a major constituent of normal connective tissue. In the latter case many successful heart valves contain collagen as a major component.

As far as designing new materials, there are clearly many difficult problems to solve. Perhaps the most rational approach is that based on testing of copolymers. In this case, varying the ratio of the monomers allows stablishment of controls for studying biocompatability. This approach is being used both with normal organic polymers and biopolymers synthesized, for example, from amino acids.

Apart from their use as prostheses, polymers are being researched for their applicability in slow drug release situations. It may, for example, be desirable to release a drug in a discrete location over a long period of time, by implanting a drug release package - uses would range from cancer therapy, through treatment of diabetes and treatment of hard narcotics by slow antagonist release. In these cases the materials researcher is faced with transport through the support matrix and specific interactions with the drug: materials properties are paramount.

The materials requirements thus range from tough strong materials for replacement of structural tissue through softer flexible materials for a range of uses inside and outside of the body to gels and release systems. All this and the physiologic interactions as well! The scope of this area of materials research is clearly limitless in extent, is certainly challenging, but is of very considerable humanitarian importance.

Alan G. Walton -
Case Western Reserve Univ.

SOCIETY NOTES

Notice to All Members - Because of the start up difficulties, dues paid in 1973 are being extended through 1974. Renewal of present memberships will not be until January 1975.

COMING EVENTS

Workshops

The Materials Research Society will be holding the following workshops of approximately 50 participants late in 1974.

- Devices and Materials for Photovoltaics - November, 1974

  Contact: Prof. Harry Gatos
  Massachusetts Institute of Technology, Rm. 13-4122
  Cambridge, Massachusetts 02139

- Advanced Materials Technologies - Wood

  Contact: Prof. Rustum Roy
  Materials Research Laboratory
  Pennsylvania State University
  University Park, Penn. 16802

- Alternative Resource Materials --- Contact: Prof. Rustum Roy

Meetings

- Defect-Property Relationships in Solids
  Princeton, New Jersey, April 1975

  Co-Chairman, J. Wernick, Bell Telephone Laboratories and
  B. Bottoms, Princeton University

- Frontiers of Materials Research, Boston, Mass., Fall 1975
  Chairman - H. Gatos, M.I.T.

- Radiation Interaction with Solids, San Francisco, Calif, Spring 1976
  Chairman, E. Kay, I.B.M.

LOGO COMPETITION

A competition to select a logo for the Society is starting. Members are invited to submit entries or suggestions to W. B. Bitler, Penn. State.

Items for the Newsletter

Members are invited to submit items or articles for the Newsletter to:

Prof. W. R. Bitler
Materials Research Laboratory
Pennsylvania State University
University Park, Penn. 16802