

University of Massachusetts Amherst

From the Selected Works of Otto Vogl

September, 1992

Second Pacific Polymer Conference in Otsu, Shiga, Japan

Otto Vogl, *University of Massachusetts - Amherst*

Tatsuki Kitayama

Koichi Hatada

Conference Reports

Second Pacific Polymer Conference in Otsu, Japan



Tatsuki Kitayama,^a Koichi Hatada^a
and Otto Vogl^b

^aDepartment of Chemistry, Faculty of Engineering
Science, Osaka University, Toyonaka, Osaka 560,
Japan

^bPolytechnic University, Six MetroTech Center,
Brooklyn, NY 11201

The Second Pacific Polymer Conference of the Pacific Polymer Federation, organized by the Society of Polymer Science, Japan was held at the Otsu Prince Hotel in Otsu, Shiga, Japan from November 26 to 29, 1991. The Conference consisted of five keynote addresses, 34 invited main lectures and 228 contributed papers, including 70 posters. A special session was held on Polymer Science and the Arts. The conference was attended by about 380 participants from 18 countries. It was organized along the following lines: Polymer Synthesis and Reaction, Polymer Characterization, Structure-Properties Relationship, High Performance Polymers, Functional Polymers and Bio-Related Polymers.

The keynote addresses were of general nature and had as a special flavor the development of polymer science in the industrial world.

The first keynote lecture was presented by Motowo Takayanagi of Fukuoka, Japan and was entitled "Microcomposite Formation of p-Aramid with Inorganic Glass and Conductive Polymers." The field of polymer alloys is attracting the interests of both polymer scientists and engineers. Even mechanical engineers who are interested in reactive processing have been attracted to this field. A number of papers on reinforcement have been reported. In these cases monomers are polymerized in situ to form

the matrix polymer to give high performance materials. Such composites are called molecular composites but Takayanagi believes it is more suitable to call them microcomposites. The author mentioned cases in which solutions of poly(p-phenyleneterephthalamide) were prepared, tetraethoxysilane was added and a crosslinking condensation to form polymeric three dimensional silicate was carried out. Subsequently, pyrrole or aniline was electropolymerized on glass and the polymers were doped with tosylate. The electroconductivity was found to be proportional to the fraction of the electroconductive polymers present. It was concluded that the composite formation provided a mechanically reinforced microcomposite without the loss of their functionality, the electric conductivity.

David H. Solomon of Melbourne, Australia described "Recent Developments in Free Radical Polymerization." Many years ago free radicals were described as neutral reactive species which were non-selective toward any substrate and their reactions were virtually uninfluenced by the solvent used. However, now radicals can be described as nucleophilic or electrophilic with selectivity in both the point of attack and the stereochemistry of addition. The importance of the role of solvent and of the reaction conditions is also generally recognized. The following points are now of current research interest in radical polymerization:



Tatsuki Kitayama



Koichi Hatada



Otto Vogl

Conference Reports



Takeo Saegusa, President (left), and James H. O'Donnell, Vice President of the Pacific Polymer Federation.

structure/property relationships in the polymers formed, particularly the importance of defect groups or structural imperfections as weak links; the controlled synthesis of low molecular weight functional oligomers; solvent effects; control of the propagation step so as to avoid head to head addition and to control the stereospecificity of the growth; and the copolymerization and challenge of predicting and controlling copolymer sequences.

"Changing Demands on the R & D Organization in an International Corporation" was discussed by J.P. Riggs of Frankfurt, Germany and Summit, New Jersey. The Hoechst Group is one of the major chemical and materials enterprises in the world, with sales of over \$28 billion in the areas of chemicals, dye stuffs, fibers and films, polymers, life sciences and technical information systems, industrial gases and engineering ceramics. Materials science and engineering has emerged as a pivotal, enabling force for industry and society as a whole. It has provided the basis for economic well-being and improved quality of life internationally; continuing advances indicate this role will only be enhanced.

Polymeric materials today have a broad impact on current, established industrial technology and the economy, with many uses familiar to all of us—clothing, furniture and furnishings, packaging, containers of all sorts and selected applications in the construction, electronics, and transportation sectors. The author emphasized the importance of the balance of classical issues of technology versus market driven opportunities. Enhancement of the linkage between all the key functions critical to business development, the establishment of a common strategic and operational framework of technology transfer, the development of multi-disciplinary, multi-functional capabilities, the development of the required new skills for the modern R & D manager, the acquisition of knowledge and the processing of information to address the problems of the environment and to develop true strength for cultural diversity: all of these comprise important points of pursuit for the future.

Yotaro Nishida, Senior Managing Director of Ube Industries, Tokyo, Japan, presented his talk on the "Key Issues for Japan's Chemical Industries Toward the 21st Century." The author outlined the recent performance of the chemical industry of Japan. He concluded that the total shipment value of the chemical

production in Japan was about 160 billion dollars, the export value was about 15 billion and the import value about 16 billion. The chemical industry represents 7.4% of the total shipment value of the whole manufacturing industries of Japan. Dr. Nishida pointed out that the problems with which the Japanese chemical industry is confronted depend on the size of the individual company. He concluded that the size of Japanese companies which are in the neighborhood of 7 to 8 billion dollars are only 1/3 to 1/4 of those of the leading U.S. and European chemical industries and Japanese companies rank only in about the 15th position among world chemical companies. Important issues for further development of the Japanese industry are globalization, the problem of environmental issues, feedstocks, in-house restructuring and the improvement of the R&D efficiency. It was concluded that the R&D expenditures are very large in the corporate budget and that it is essential to improve the R&D efficiency. Important factors are: focused concepts, professional management support, adaption to the market and *patience*. Targeted future developments include increased sales and promotion of overseas development and globalization.

"The Next 30 Years—Will it Fulfill Our Expectations?" was presented by Robert M. Nowak, Vice President and Director of Corporate Research of the Dow Chemical Company, Midland, Michigan. Dr. Nowak pointed out that the future has never been brighter for science and the commercialization of new products. Never have more scientists been at work continuing to build already established scientific bases and creating completely new scientific bases from which whole new industries can be born. This development is characterized by more intense global competition. The emergence of new democracies will allow them to develop capabilities to compete with the well-established major economic powers. More multinational alliances will take advantage of the unique positions of each of the partners. More



Otsu Prince Hotel



Opening session—Koto performance.

cooperation multinationally is very expensive; highly scientific areas will emerge and whole new areas of science and the invention of new materials will enable us to develop new degrees of freedom in new commercial applications.

Joint ventures and alliances aimed at rapidly penetrating markets are quickly developing, as are new areas of science and technology which are exploding all around us. The world of advanced engineering materials is already very large but there are additional exciting areas: new engineering thermoplastics, new high performance thermotropic liquid crystals, lyotropic liquid crystals, molecular composites, advanced composites, non-linear optical polymers and electronically conducting polymers. Dr. Nowak concluded that the promise of the future makes the discoveries of the past insignificant.

The invited lectures started with a presentation by Walter Heitz of Marburg, Germany on "Pd-Catalyzed Synthesis of Monomers and Polymers." Metal catalyzed reactions provide the synthesis of monomers and a new approach to many polymers. The Pd catalyzed reaction of halogenoarenes with olefins gives access to monomers in a one-set reaction. Pd (II) compounds are also initiators for some vinyl polymerizations. Polynorbornene can be formed using such catalysts. Poly(phenylene vinylene), poly(phenylene ethynylene), and poly(p-phenylene) can also be prepared by Pd catalyzed reactions.

"Rigid Chain Vinyl Polymers from Multi-Substituted Ethylenes" was discussed by Takayuki Otsu of Osaka, Japan. A number of multi-substituted ethylenes homopolymerized in the presence of a suitable initiator produce high molecular weight polymers consisting of a substituted polyethylene structure which has a methylene group in the repeating unit.

Bruce E. Smart of the Du Pont Company in Wilmington, Delaware discussed "Silicon-Mediated Synthesis of Poly(fluorovinyl ethers) and Poly(perfluoroalkenes)." The preparation of high molecular weight fluorinated polyethers of well-defined structure is a long-standing goal in fluoropolymer synthesis. Conventional ring-opening, anionic polymerization of fluorinated epoxides suffers from complicating chain-transfer processes. It has been discovered that an anion-catalyzed reaction between silyl ethers and perfluoroalkenes gives partially fluorinated vinyl ethers in high yields; this reaction can be extended to difunctional derivatives to produce condensation polymers in very high yields.

"Synthesis of Functional Block Copolymers and Formation of Polymer Assemblies" was presented by Seiichi Nakahama of

Tokyo, Japan. The synthesis of functional polymers with well-defined structures has been developed by means of anionic living polymerization of protected functional monomers. More than thirty styrene, 1,3-butadiene and methacrylate derivatives whose functionalities were masked were synthesized. Synthesis of functional block copolymers and telechelic polymers as well as the characterization of these assemblies were described.

"Polymer Degradation Studies by FTIR" was described by Richard G. Davidson of Ascot Vale, Victoria, Australia. Polymer degradation described as physical or chemical change that leads to an undesirable change in the properties of polymers was studied using FTIR spectroscopy. Thermal degradation was studied by FTIR analysis of pyrolysis gas evolved; mechanical and chemical degradation was also studied.

"Tailored Design of New Polyphosphazenes with Special Properties" was described by Harry R. Allcock of University Park, Pennsylvania. The synthesis of polymers from petrochemical intermediates have been a major force in the development of polymer chemistry. Entire new classes of polymers are needed in advanced areas. A large class of such polymers are the so-called poly(organophosphazene). They are synthesized by the two-step process. Ring-opening polymerization hexachlorocyclophosphazene leads the linear polymer. Halogen replacement reactions of this polymer lead to the formation of a broad range of stable and very useful derivative polymers. Polymers which have special materials properties were described in this lecture, such as those with low temperature elasticity, solid-ion conduction, liquid crystallinity, non-linear optical behavior and biomedical and biological activity.

"Electron Spin Resonance as a Probe in Polymer Systems" was described by Peter J. Pommery of St. Lucia, Australia. Chemical microstructure of polymer molecules, their stability and hostile environment, their relations with other chemical species and their dependence on polymerization conditions have been of great general interest. Major thrusts have been made in polymer degradation, polymerization which leads to structure of polymers and copolymers that are closely related to the experimental condition and the nature of the polymerization reactions.

"Direct Evidence for Transition-Metal Coordination in Polymer Blends" was described by Laurence A. Belfiore of Fort Collins, Colorado. A thermodynamic interpretation of the ligand field



Renyuan Qian and M. Takayanagi



J. and O. Vogl in discussion with R. Chujo (center) and Y. Nishida (right).

stabilization energy appropriate to octahedral d8 complexes was employed to estimate the synergistic enhancement of the glass transition temperature in blends of nickel acetate with poly(4-vinylpyridine). The maximum enhancement of the T_g is approximately 100°C, which occurs at a metal/polymer-repeating-unit concentration of 1:2 on a molar basis.

"Physical Characterization of Stereocomplexes" was presented by Robert E. Prud'homme of Quebec, Canada. Isotactic and atactic polyesters have been prepared by ring opening polymerization of optically active and racemic alpha-disubstituted beta-betapropiolactones respectively. Mixtures of the two isotactic polymers of opposite absolute configuration were found to form crystalline stereocomplexes. Solid state NMR studies suggested that the isotactic and atactic polymers and the stereocomplexes adopted 2/1 helical conformations. Electron and x-ray diffraction measurements revealed three different crystal modifications; monoclinic for the melt crystallized isotactic polymer, orthorhombic for the stereocomplex, and orthorhombic (containing 2/1 antiparallel helices) for the atactic and solution cast isotactic polymers.

Toshio Nishi described his work on the "Characterization of Polymer Systems by Real Time Pulsed NMR." Numerous ways exist to characterize polymer systems from the atomic or molecular scale to the macroscopic scale. They are divided into two large groups which involve the structure of polymer systems and the molecular motion in polymer systems. A real time pulsed NMR system controlled by a microcomputer was developed to study dynamics of structure formation. This system that has been successfully applied to study crystallization processes, gelation processes and other similar processes.

Zbigniew H. Stachurski of Melbourne, Australia presented his work on "Additivity Rule and Other Approaches to Non-Isothermal Crystallization." He discussed the definition of crystallization processes, the non-isothermal kinetics and additivity rules according to Nakamura and Ziabicki. Transformation kinetics of the integral method including experimental data to illustrate the above approaches were discussed.

Kunio Hikichi of Sapporo, Japan presented the "Use of Two-Dimensional NMR for Polymer Characterization." NMR spectroscopy is a powerful tool for characterizing the microstructure of synthetic polymers. The most important key-point of the NMR method is the resonance assignment of spectra. The author described

the various possibilities of using NMR spectroscopy in the broadest way. It was demonstrated that 2D NMR was very helpful for polymer characterization.

Takeji Hashimoto of Kyoto, Japan described "Self-Assembly of Polymer Blends at Phase Transitions." Mechanism and kinetics of supermolecular structure formation and its growth ("self-assembly") of polymer blends at phase transitions from a single phase state to a two-phase state are an important subject in polymer science and technology. Basic information obtained in the studies of self-assembly leads to the control of morphologies, functionalities and properties of polymer blends. Discussed in this paper were the pinning processes such as (i) spontaneous pinning, (ii) physical pinning and (iii) chemical pinning, all of which commonly involve freezing in the translational diffusion of center of masses of one consistent polymer at least.

The "Influence of Changes in the Chemical Structure of Natural Rubber on Physical Properties" was presented by Sidek bin Dulngali of Kuala Lumpur, Malaysia. Natural rubber consists almost entirely of head-to-tail *cis* 1,4-polyisoprene produced by nature. Several modification techniques of natural rubber were investigated such as epoxidation, grafting, molecular weight reduction and *cis-trans* isomerization which effects the physical properties of the resulting polymers.

"The Third-Order Susceptibility of Nematic Solutions of Rodlike Polymers" was discussed by Guy C. Berry of Pittsburgh, Pennsylvania. The third-order susceptibility tensor $\chi(3)$ has been studied for well aligned nematic solutions of the rodlike polymer poly(1,4-phenylene-2,6-benzobisthiazole). $\chi(3)$ was studied by third harmonic generation or degenerate four-wave mixing.

"Viscoelastic Properties of Semidilute Polymer Solutions Polyelectrolyte" was presented by Ichiro Noda of Nagoya, Japan. Viscoelastic properties of polymer solutions in the terminal region were discussed in terms of two parameters representing energy dissipation and storage. Few studies on viscoelastic properties of polyelectrolyte solutions have been discussed in the past. It was concluded that the polyelectrolyte solutions in the semi-dilute regions and in the entangled regions can be explained by the reptation model assuming that the correlation length related to entanglements was determined by the electrostatic interaction evaluated from the Donnan equilibrium in the respective salt concentration.

"Absolute Quantitation of SEC and Applications" was described by Rongshi Cheng of Nanjing, China. The fundamental rules of absolute quantitation of concentration detector response of SEC were clarified. With the aid of those rules, the specific refractive index increment of the polymer and its molecular weight dependency, the absolute chain length distribution and individual polymerization rate constants of oligomer and the average composition of copolymers could be determined directly by the use of conventional SEC equipment and normal operating procedure with single solvent as eluent.

Yasuhisa Sakurai of Tokyo, Japan presented his work on "Intelligent Biomaterials." Biomaterials, including metals, ceramics, polymers and biological materials were applied to the wide range of medical subjects, such as disposable medical products, surgical implants, dental materials, artificial organs and, moreover, to the field of biotechnology. Artificial organs made of advanced biomaterials, support only survival, but also daily life or quality of life of approximately 10 million people throughout the world. Drug delivery systems where drugs are combined with carrier materials



Poster session.

to maximize their beneficial effect and to minimize adverse hazards are being realized for precise drug therapy in medical practice.

"Improved Polymers for Medical Implants" was discussed by Gordon F. Meijjs of Clayton, Victoria, Australia. Segmented polyurethane elastomers are frequently used in the construction of medical devices, such as cardiac pacemakers, heart valves, catheters, and heart assist devices, because of their excellent mechanical properties and haemo- and histo-compatibility. Polyether macrodiols such as poly(tetramethylene oxide) are used to prepare polyurethanes for implants, since they offer increased resistance to hydrolysis compared with polyester-based polyurethanes.

David A. Tirrell of Amherst, Massachusetts presented his work on "New Polymers From Artificial Genes." The synthesis and expression of artificial genes constitutes the only direct route to uniform population of polymer chains. Over the last several years Dr. Tirrell has used this method to address the issue of structure organization in polymeric solids, particularly periodic polypeptides were designed with the objective of fabricating lamellar crystals of controlled thickness and surface functionality.

Junzo Sunamoto of Kyoto, Japan discussed his work on "Effective Reconstitution of Cell Membrane Proteins into Artificial Cell Liposomes." Perfect extraction of intrinsic membrane proteins or enzymes from intact cells and reconstitution into artificial cells, liposomes, without any denaturation and deactivation, is a basic requirement for the investigation of the function of membrane protein engineering. A new artificial boundary lipid to make liposomes more stable and cell recognizable was developed. Recently, the direct transfer of membrane proteins from human erythrocytes, platelets, has been accomplished.

"Synthesis and Properties of Rod-Like Polypeptide Stars" was presented by William H. Daly of Baton Rouge, Louisiana. The thermotropic and lyotropic properties exhibited by poly(γ -alkyl substituted α -L-glutamates) prompted the investigation of a direct synthetic route to star polymers containing peptide arms. The peptide α -helix, which imparts rod-like character to the macromolecule, coupled with a long aliphatic side chain, created a unique hydrophobic semi-rigid rod.

Young Ha Kim of Seoul, Korea described "Negative Cilia Concept for Enhanced Blood Compatibility." In order to prepare blood compatible polymeric surfaces, research has been carried out on the basis of several hypotheses such as negative surface charge, surface or interfacial free energy, pharmacologically active surface

and surface motion. It was found that the polymers grafted with hydrophilic poly(ethylene oxide) showed less protein absorption platelet absorption to improve the antithromogenicity significantly. It was found that the surface reaction of all modified materials was effective.

Donald H. Schulz of Exxon in Annandale, NJ discussed "Functional Water Soluble Polymers." He determined that functional polymers are macromolecules containing functional groups which have polarity/reactivity differences from backbone chains. Alternatively, functional polymers can be viewed as materials that have a function or a use. Functional polymers show often unusual or improved properties by virtue of enhancement in phase separation, reactivity or association. The author described the study of combining viscosifying effects of hydrophobic association with the thermal stability of N-vinylpyrrolidone and the high molecular weight capability of acrylamide. Specifically terpolymers of various acrylamides were synthesized and their properties, especially their hydrolytic stability, were studied. This work was clearly directed toward the development of the most effective and cost efficient polymer structures for tertiary oil recovery.

Tsuneyoshi Okada discussed his work on "Recent Development Status of LCP Applications." He described types of LCP's characteristic of LCP's including high strength, high modulus, low coefficient of linear thermal expansion, wide range of temperature usage, damping, high flowability, and applications. For the applications of LCP, he described the importance of injection molding, the preparation of fibers, films and polymer blend/alloys.

The "Synthesis and Properties of Sequentially Ordered Aromatic Copolyesters and Regio-Regularly Ring Substituted Aromatic Homopolyesters" were described by Jung-II Jin of Seoul, Korea. Development of proper synthetic methods for the preparation of (co)polymers having well defined microchemical structures was found to be a prerequisite for the establishment of structure-property relationships. A series of wholly aromatic copolyesters with well-defined or ordered comonomer sequences was established.

The "Control of Miscibility in Polymer Blends Via Introducing Specific Interactions" was discussed by Ming Jiang of Shanghai, China. Polymer-polymer miscibility is one of the most basic



Seizo Okamura, opening the session on polymer science and the arts.

Conference Reports



T. Musha, explaining the beauty in music.

factors governing morphology and properties of polymer blends. Although preparing polymer blends with desirable properties does not necessarily need complete miscibility between components, making the miscibility controllable is certainly beneficial for realizing the molecular design of multicomponent systems. The author discussed blends with introduced hydrogen bonding, IPNs with introduced hydrogen bonding and blends with introduced ion-ion interactions.

"Morphological Studies of High Performance Network Polymers" was discussed by R.P. Burford of Kensington, Australia. Unique properties of block copolymers arising mainly from their thermally reversible cross-linked nature has been attributed to microscopic separation into hard and soft segments. Domain



Ladies program.

dimensions and shapes depend on many factors including molecular dimensions and thermodynamic interactions of the block components. Thermodynamic theories are also well established to explain the change from spherical to cylindrical to lamella morphology as second monomer content increases. Equilibrium domain structures depend primarily upon component weight fractions but also upon segment molecular weight.

Additional interesting subjects were treated in the poster session and in the session on contributed papers. We found interesting the paper by Hiromichi Noguchi on "Synthesis and Reaction of Ionenic Oligomers," "Novel Dendrite Macromolecular Architecture: Practical One-step and Multi-step Convergent Approaches to Hyperbranched Polyesters" by Craig J. Hawker, "Synthesis of Starburst Polysiloxanes" by Atsushi Morikawa, "Polymerization of 2,3-Azabutadiene Derivatives" by Mikiharu Kamachi, "Helix-Sense Reversal of Chloral Oligomers in Solution" by Koichi Ute, "Perfluoroelastomers-Curing Chemistry and Properties" by Anestis L. Logathetis, "Novel Fluorinated Oxazoline Polymers-Synthesis and Application" by Mureo Kaku, "Interaction of Thermosensitive Hydrogel Microspheres with Protein," by Haruma Kawaguchi and "Solid State Behavior of Polyrotaxanes: Linear Chains Through Macrocycles" by H. Marand.

As indicated earlier, a special session was reserved for *Polymer Science and the Arts*. Seizo Okamura of Kyoto, Japan discussed "The New Trend of Polymer Science and Technology for Humanity." Arts and sciences were briefly imagined in two ways, one comprehensive approach toward "from the Arts to Sciences" and the other "from Science to the Arts." He concluded that investigations on macromolecular constance was very analogous to that of brain mechanisms in which the relation between polymer and brain is more important. Importance of research in polymer science and the arts is becoming recognized in science as well as in technology.

Elizabeth A. McCullough of Manhattan, Kansas discussed "Liquid Barriers and Thermal Comfort Properties of Surgical Gowns." Comfort and efficiency are very important factors involving the utilization garment in medical devices.

Toshimitsu Musha presented his work on "Fluctuations, Disorder and Beauty." This was a rather remarkable lecture; the author asked the question whether the judgement of value for works of art is based on physiological phenomena. He concluded that musical sound can easily be discriminated from noisy sound even if one



At the banquet.



Council meeting.

bears that piece of music for the first time. The sound of music is defined as the time sequence of sound whose acoustic frequency is subject to $1/f$ fluctuations. The whispering of a stream flowing through a forest makes us feel comfortable and relaxed. This is sometimes called music played by nature. There is another mystery associated with music. Composers hundreds of years ago could give us excitement even if we do not now share with them cultural and religious similarities, we share the same standards for the judgement of value. The author also concluded that musical sounds have the same structure as that of biological rhythm fluctuations.

An axon of a neurocell is a very nonlinear transmission line for propagation of actions of potential impulses coded by biological sequences. The conduction speed is influenced by the foregoing impulses. It may happen that the time relation of impulses is modified during the conduction. Hence the biological signal is distorted. Only the order of the action is especially favorable to $1/f$ modulated biological signals; the biological clock has $1/f$ fluctuations. The heart beat looks very regular, however it is fluctuating around its mean value by about 10%. The author also described the condition under which $1/f$ fluctuation makes us uncomfortable and he ultimately concluded that real beauty is an ordered disorder.

Miyoshi Okamoto from Otsu, Japan described "Polymer Materials Which Appeal to Kansei." Half of the annual textile imports in Japan are imported from Italy and France. Most of those textiles are of a good sense called Kansei Shō-hin, the sensible goods. The author described sensibility Kansei in various ways. Today, flexibility, imagination, comfortableness and quick responses are four major factors, very important in everyday life, suggesting at times Gosei, which means wisdom but may be defined as the intellectual capacity to create a unified concept upon the sensory experience received through Kansei. On the other hand Risei (reason) is a prerequisite in the development of polymer materials.

Shinji Yamaguchi described "Learning Through Nature for the Creation of New Textile Fabrics." He pointed out that by the 60s, natural fiber material had been exhausted, and synthetic polymers, invented to provide substitute materials, had been adapted for clothing, durables and easy-care materials. Progress has been made and new fiber assemblies have been created. Shape factors have been introduced recently that natural fiber could not have offered; they are innovative materials from the point of view of function and sensitivity and are now called Shin-

Gosen. Beauty of the silhouette and from touch to function have been achieved by learning from nature.

"Polymer Science and the Arts" was an interesting session and the description of beauty and music was especially very exciting.

The Second Pacific Polymer Conference in Otsu began with a preconference tour which brought some of the participants by chartered bus to the Matsushita Electric Company Ltd., Osaka, and to Toray Industries Inc., Otsu. On Monday, November 25, a Welcoming Reception was held at the Otsu Prince Hotel in the style of a traditional opening reception of an international conference organized by the Society of Polymer Science, Japan. It gave the participants of the Second Pacific Polymer Conference the opportunity to meet and to get acquainted with each other. On Wednesday, November 27, the official Conference banquet was held at the Prince Hotel.

The organizers had planned for excursions on November 28 to the Hikone Castle and the Saigyōji Temple, which are among the national treasures of Japan. The Sayonara party at the Otsu Prince Hotel provided a fitting conclusion for the Second Pacific Polymer Conference.

At the Meeting of the Council of the Pacific Polymer Federation, it was decided that the next Conference of the Federation will be held at the Gold Coast of Australia, December 13 to 17, 1993, and the meeting thereafter in Hawaii in November or December 1995.

The Second Pacific Polymer Conference was an excellent meeting; it brought together almost 250 participants from Japan, 46 from the U.S., about as many (35) from Korea, 15 from China, and 12 from Australia as well as representations from other countries of the Pacific basin. The participants expressed great satisfaction with the organization and the technical contents of the Second Pacific Polymer Conference and concluded that they were looking forward with enthusiasm for the next Pacific Polymer Conference. The Third Pacific Polymer Conference in Australia will be under the chairmanship of Professor James H. O'Donnell.

The Council Meeting also concluded that the Pacific Polymer Federation would encourage and cosponsor smaller meetings such as workshops on specific subjects between the official Pacific Polymer Conferences in other countries that are members of the Pacific Polymer Federation. Professor David Hill of Australia was appointed Chairman of the Committee that will be responsible for smaller meetings. Meetings are envisioned in Malaysia and in New Zealand in the very near future.