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H. Pacific Polymer Federation Conference Reports

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First Pacific Polymer Conference

Gerald Kirshenbaum

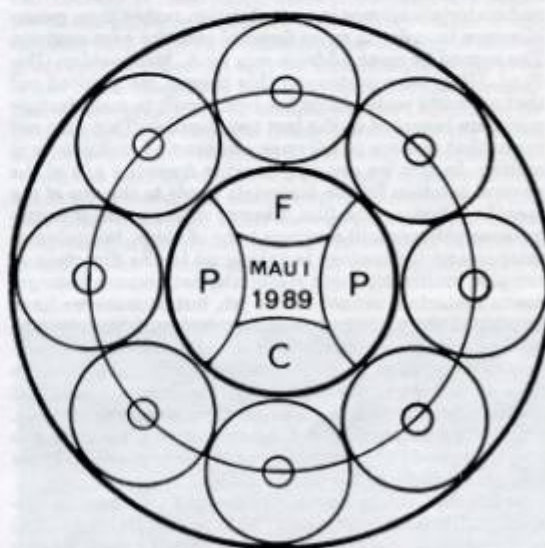
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The Pacific Polymer Federation was created in 1987 as an organization to advance and benefit polymer science and technology in the Pacific Basin. Its objectives are to encourage and facilitate; (a) interaction between polymer organizations of the Pacific Basin and (b) an exchange of scientific knowledge through regional meetings and visits between polymer scientists. The Federation was founded by the Division of Polymer Chemistry, American Chemical Society, the Society of Polymer Science Japan and the Polymer Division, the Royal Australian Chemical Institute. Since its founding, polymer societies in Canada, Korea, Malaysia, New Zealand and China have become Members of the Pacific Polymer Federation. The officers of the Federation are Otto Vogl (USA), President, Takeo Saegusa (Japan), Vice President, James O'Donnell (Australia), Deputy Vice President and Joseph Salamone (USA), Secretary/Treasurer. Members of the Council include A. Abe (Japan), D.J.T. Hill (Australia), R. Karim, (Malaysia), C.Y. Kim (Korea), M. Navratil (Canada) and Renyuan Qian (China).

The First Pacific Polymer Conference was held at the Royal Lahaina Resort in Maui, Hawaii, December 12-15, 1989. This was the first conference organized by the Pacific Polymer Federation, and was a huge success. Hawaii was chosen for this first meeting because it was centrally located in the Pacific Basin. The Symposium Topics included Polymer Synthesis, Characterization, High Performance Polymers, Functional Polymers, Liquid Crystalline Polymers, Electro and Optically Active Polymers and Bio-Related Polymers. These topics were discussed through a series of 5 keynote addresses, 35 invited lectures, 120 contributed papers and 125 posters. In addition, a Panel Discussion was held on Polymer Science



and the Arts. Over 400 scientists attended the meeting representing 19 countries throughout the Pacific Region and Europe. This report will highlight the keynote and invited lectures.

The technical sessions of the Conference began with a keynote address by K. Fukui, (Institute for Fundamental Chemistry, Kyoto, Japan) Nobel Laureate in Chemistry



Royal Lahaina Resort.

(1981), who discussed the future aspects of the science of matter and macromolecules. The future of both science and materials science is specialization rather than generalization in order to move forward into the next century. The second keynote address was by A. MacLachlan (DuPont, USA) who continued this theme. He pointed out that no world scale plants are being built to manufacture polymers invented in the last two decades. This does not mean that the era of polymer science and technology is ending. In fact we are only moving from the age of the general solution for our materials needs to the age of the specific solution. The film, fiber or object made of homogeneous polymer will continue to be of value, but polymer science and technology is taking us in the direction of complex multicomponent materials; not because homogeneous materials cannot do the job, but because we have developed the ability to conceive, design, fabricate, and characterize products made of several substances, cleverly engineered at the microscopic, or molecular level, to take advantage of the capability of each component and create products with the desired macroscopic properties. Examples from industries ranging from food packaging to sporting goods to microelectronics were given to show how we continue to "do more with less".

In the concluding keynote address of the opening session, B. Christensen (Merck, Sharpe and Dohme, USA) explained that natural products chemistry uses organic chemistry in the isolation, structural determination, synthesis, and synthetic modification of naturally occurring substances. However, the synthetic chemistry of naturally occurring and bioactive polymeric substances has not kept pace with the advances in other areas of science. Several areas of potential interest to "natural polymer chemists" were discussed including the formation of conjugate vaccines, glycosylation of bioengineered pep-

tides, as well as semi-synthetic modification of natural polymers.

The President of the Pacific Polymer Foundation, Otto Vogl (Polytechnic University, USA) gave the first invited lecture on Macromolecular Design and Architecture. We are now entering an epoch in which it seems to be feasible to synthesize not only polymers with exactly predetermined configuration, but also with predetermined conformation. Professor Vogl reviewed some of the advances in polymerization techniques, that have led to predetermined structures, functionalized polymers, giant rings and purely helical polymers with macromolecular asymmetry.

Following Dr. Vogl's presentation, the Conference moved from the lecture hall, outdoors, to the shores of the Pacific (under the stars and palm trees) for a wonderful welcoming reception. Here there was plenty of food, drink, greeting old friends and making new acquaintances.

The second day of the Conference opened with an invited lecture by John Haylock (Himont, USA), who pro-



Welcoming speech - H. Taures, Mayor, Maui County.



Otto Vogl, President, Pacific Polymer Federation, opens the First Pacific Polymer Conference.



Speakers left to right, front row T. Higashimura, A. MacLachlan, O. Vogl, T. Saegusa, J. O'Donnell, second row, J. Salamone, A. Abe, R. Karim, C.Y. Kim, C. Morris, third row, R. Gaudlana, S. Israel, M. Yamabe, K. Ghigino, top row N. Edmonds, D. Hill, D. Napper, J. Verbicky, and W. Bailey.

vided an excellent review and update on the development of catalysts for polyolefin polymerization and subsequent property profiles. M. Yamabe (Asahi Glass, Japan) presented a report on recent progress in fluoropolymers. He discussed some of the newer copolymers of fluoroolefin and hydrocarbon monomers for melt processable resins, elastomers, weather resistant paint resins and oxygen enrichment membranes, and functional perfluoropolymers for chlor-alkali production as well as polymerization technology.

The copolymerization of olefin-terminated oligomers and polymers (macromonomers) with common monomers has become one of the most effective and versatile methods for synthesizing well-defined graft copolymers. In this procedure, the chain length of the macromonomer (graft) can be preselected and the spacing of the grafts can be predicted from knowledge of the reactivity ratios of the macromonomer with a given monomer. E. Rizzardo (CSIRO, Australia) reviewed new synthetic approaches to produce macromonomers and their copolymers. J. Verbicky (G.E., USA) introduced G.E.'s recently developed, effective synthetic methodology for the preparation of macrocyclic oligomers of aromatic condensation polymers and their ring opening polymerization chemistry. This technology may revolutionize the processing of high performance engineering thermoplastics such as polycarbonate, acrylate, etherimides, and etherketones. T. Higashimura (Kyoto University, Japan) discussed new initiating systems for living cationic polymerization based on nucleophilic stabilization of the carbocation of vinyl monomers and the synthesis of a variety of new polymers thereby.

W.J. Bailey (University of Maryland, USA), in his last

lecture before his untimely death, showed that free radical ring-opening polymerization of cyclic ketone acetals led to aliphatic polyesters and especially when copolymerized would lead to biodegradable polymers.

C.Y. Kim (KAIST, Korea) studied the effects of both the dopant and solvent on the movement of the ions (as measured by chronoamperometry) in polypyrrole systems. K. Maeda (Asahi Chemicals, Japan) explained that in addition to high performance, high function and multifunction, a new important property for engineering plastics in Japan was "high touch". This can be viewed as fashion in fibers and low noise, and beautiful surface polymers in automotive. He introduced several new Asahi developments to meet these market needs including a styrene-olefin block copolymer, a highly-lubricated polyacetal, bright surface injection molding technology and gas injection molding.

The ability of polymers to associate in solution creates additional complexities in the study and understanding of their solution behavior relative to traditional, non-associating polymers and usually results in interesting and often advantageous solution properties. J.C. Salamone (University of Lowell, USA) reviewed some recent investigations of associating polymers in solution including a hydrophobic polyampholyte, hydrophobic polyethylene oxides and an ionic, Kevlar derivative believed to be lyotropically liquid crystalline. E. Tsuchida (Waseda University, Japan) synthesized branched polyethylene oxide polymeric solid electrolytes which have excellent ionic conductivity at room temperature and related this behavior to the polymer structure and cation radius. Block, random and graft copolymerization have provided us great opportunities not only for modification of the properties of the respective homopolymers but also for creation of new properties. K. Hatada (Osaka University, Japan) reported on two new living systems for the highly stereospecific polymerization of methyl methacrylate which can lead the way to the synthesis of many various kinds of stereoregular block or random copolymers. E.P. Woo (Dow Chemical, USA) showed that catalytic decarboxylation of copolycarbonates can be used to form ordered blocks of aryl ethers and aryl carbonates. T.



Professors K. Hatada, R. Hoffmann, Otto Vogl (left to right).

Conference Reports

Saegusa (Kyoto University, Japan) reviewed the ring-opening polymerization of a family of 2-oxazolines which leads to polymers which are very hydrophilic and even hygroscopic. This technique may be used to form three novel functional polymers, non-ionic surfactants, non-ionic hydrogels, and an organic/inorganic polymer hybrid.

C.E.M. Morris (DSTO, Australia) explained the role of cure condition on the properties and performance of epoxy resin systems which are increasingly being used in high performance structural composites. A.J. Heeger (University of California, Santa Barbara) brought us up to date on recent advances in the synthesis and processing of conducting polymers which have demonstrated that one can have materials with the electronic and optical properties of metals and semiconductors and the processing and mechanical advantages of polymers.

Photoactive materials have been developed extensively in the fields of electrophotography, optical communication, display, and so forth. Among them the nonlinear optically (NLO) active compounds are key materials for "photonics" application, that is, optical image processing and/or switching elements in the next generation optical computing systems. H. Sasabe (RIKEN, Japan) reviewed some new work that showed that organic intramolecular charge transfer compounds have anomalously large optical nonlinearity and show ultrafast responses. D. Napper (University of Sydney, Australia) demonstrated the role of the preformed polymers and the compartmentalization of the free radicals in free radical emulsion polymerizations. D.J.T. Hill (University of Queensland, Australia) discussed some of his group's recent studies on the copolymerization of styrene and acrylonitrile and how NMR can be used to evaluate the copolymerization mechanism.

Concentration gradient in polymeric materials is becoming one of the most important factors in the molecular design of them. SIMS (Secondary Ion Mass Spectrometry) is applicable to the depth profiling of polymeric materials. R. Chujo (Tokyo Institute of Technology, Japan) showed why this technique is quite promising in studying the concentration gradient. R. Gaudiana (Polaroid, USA) described investigations to design and synthesize modified rod like aromatic polymers that could be processed into highly oriented, optically uniaxial, colorless, transparent (non crystalline) films and fibers for optical applications.

S. Yamashita (Kyoto Institute of Technology, Japan) reported on the synthesis and properties of new functional elastomers such as copolymers of 1-chloro 1,3 butadiene and 1,3 butadiene, ionene-type viologen elastomers, and ABA type liquid crystalline elastomers. In a similar vein, A. Kadir, (Rubber Research Institute of Malaysia) discussed various physical (powder and blend technology) and chemical (pendent functional groups, grafting, molecular rearrangement) modifications of natural rubber.

Naphthoquinone diazide (NQD)-novolak type positive photoresist has been widely used in the field of high resolution optical microlithography for years. In this resist system, the most fundamental reaction is naturally the photochemical transformation of NQD which makes the resist drastically soluble to an alkaline developer in the exposed region. Non-photochemical reactions of NQD like



Keynote speaker Burton G. Christensen.

thermal and base catalyzed reactions are also becoming important because those reactions can be utilized to improve the resist performance which must satisfy the stringent requirements from the ever-getting finer microcircuit fabrication. Y. Harita (Japan Synthetic Rubber Company) described these reactions of NQD and their roles in resist processes. K.P. Ghiggino (University of Melbourne, Australia) reviewed the development of picosecond laser-based time-resolved fluorescence instrumentation and the application of sophisticated computer-aided data analysis procedures that have enabled the direct study of ultrafast electronic energy transport phenomena in macromolecules following absorption of radiation. J.H. O'Donnell (University of Queensland, Australia) explained that radiation-induced changes in polymers are influenced by many parameters, including their chemical structure and morphology and the measurements of the yields (G values) of chemical change are essential to develop quantitative models of radiation degradation. Some of the techniques presently being developed to give improved measurements (solid-state NMR, GPC, Mz) were discussed.

G.W. Calundann (Hoechst Celanese, USA) brought us up to date on the commercial developments in the field of thermotropic liquid crystalline polymers. He especially stressed melt-spinnable fiber developments including the effects of monomers and process variables on fiber properties. T. Kajiyama (Kyushu University, Japan) described polymer/(liquid crystal) composite films which are useful for light switching devices and informational displays. The aggregate states and electro-optical properties of these novel composites were reviewed. S. Inoue (University of Tokyo, Japan) has developed metalloporphyrin catalysts that are excellent initiators for living polymerizations of a variety of cyclic and vinyl monomers such as epoxides, episulfides, lactones, methacrylates, etc.

Peter M. Robinson (Invetech, Australia) traced the history of the polymer industry in Australia. The majority of the R&D efforts have been focused on processing and fabrication techniques and optimization of polymer performance. The Australian Industrial Research and Development Board has targeted several key areas for future development and growth such as the first polymer-based

bank note, novel ion exchange resins for effective water purification, and polyethylene automotive fuel tanks. In a similar vein, R. Karim (Petroleum Research Institute, Malaysia) explained that Malaysia has a considerable reserve of natural gas, and although it does not have a large enough population or sufficient downstream polymer fabrication industries, several major international corporations are planning large petrochemical (and polymer) complexes since it's in a good location to supply the Asia-Pacific market. M. Hirooka (Kobe University, Japan) described the polymer evolution has having gone through three distinct generations, developments of general purpose resins, engineering plastics, and super engineering plastics. We are now approaching the fourth generation which will involve tailoring polymers at the molecular level such as conjugated polymers for conductivity and optical properties and synthetic polymers for biological systems.

The Conference ended, as it began, with two important keynote addresses. Nobel Laureate Roald Hoffmann (Cornell University, USA) explained that we are all familiar with diamonds and graphite but there are other allo-

tropes of carbon that should be studied to determine their properties and applications. Y. Ito (Chairman of the Board, Toray, Japan) stressed that as the chemical field is transforming itself into the "New Chemistry", so must the polymer industry reform itself into a more intellectual and humanistic one. This will be based on the intermixing or fusion of different disciplines such as polymer chemistry with such leading-edge sciences and technologies as biotechnology, electronics and computer design. This will lead to continued growth of polymers in new fields such as advanced composites, biological and medical systems and optical and electrical applications.

Some copies of the Pacific Polymer Preprints for this Conference are available for \$200. Please contact Jane Vogl, Pacific Polymer Federation, Polytechnic University, 333 Jay Street, Brooklyn, NY 11201 (718-260-3069). This was a highly successful conference and indeed the Second Pacific Polymer Conference is already being planned for November 26-29, 1991 in Shiga, Japan. For information contact Professor T. Saegusa, Department of Synthetic Chemistry Kyoto University, Yoshida, Sakyo-ku, Kyoto 606, Japan, or Jane Vogl (see address on page 191).

Second Pacific Polymer Conference in Otsu, Japan



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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



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

Conference Reports



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 α -disubstituted beta-propiolactones 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 Dulgali 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. Meijs 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(gamma-alkyl substituted alpha-L-glutamates) prompted the investigation of a direct synthetic route to star polymers containing peptide arms. The peptide alpha-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 Compatability." 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.

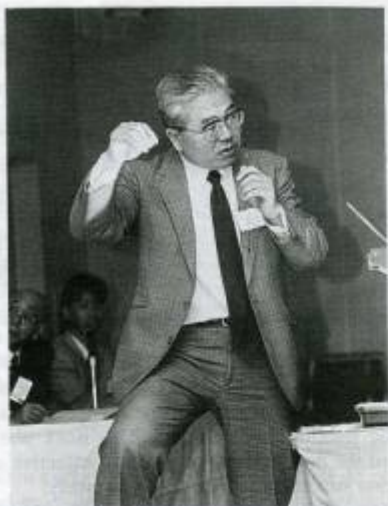
The "Synthesis and Properties of Sequentially Ordered Aromatic Copolyesters and Regio-Regularly Ring Substituted Aromatic Homopolyesters" were described by Jung-II Jin of Seoul, Korea. Development of proper synthetic methods for the preparation of (co)polymers having well defined microchemical structures 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 Ionene 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.

hears 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 sequels; 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 Sho-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 Saimyoji 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.

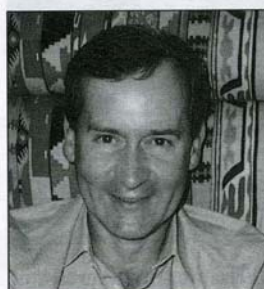
Third Pacific Polymer Conference Gold Coast – Australia



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Graeme George



Otto Vogl

The 3rd Pacific Polymer Conference was held at the Conrad International Hotel at the Gold Coast of Australia from December 13 to 17, 1993. It attracted about 450 participants from 19 countries. It consisted of 47 invited lectures and 390 papers, 240 in the form of oral presentations and about 150 in poster form. The meeting was organized by the Polymer Division of the Royal Australian Chemical Institute. The chairman of the meeting was James H. O'Donnell, with Donald H. Napper and David H. Solomon as the Vice-chairmen; Peter J. Pomery was the Secretary and David J. T. Hill the Treasurer. The Pacific Polymer Preprints had an impressive 900 pages.

The 3rd Pacific Conference has as its highlight two Plenary Fora: "The Future of Polymer Science and Technology in the Pacific Region" and "Polymer Materials and the Environment." Many important subjects were covered during the conference: Polymer Synthesis, Polymer Characterization, Polymer Crystallization, Polymer Kinetics, Polymer Surfaces, Polymer Degradation, Polymer Networks, Polymer Diffusion, Polymer Engineering, Polymer Membranes, Polymer Blends, Polymer Composites, Structure/Property Relationships, Biopolymers, Conducting Polymers, Liquid Crystalline Polymers, Modelling, Optoelectronics, Elastomers and Polyesters. Of more general interest was the attention that was paid to Polymer Education. As in the last two conferences, one day was set aside for a symposium on "Polymer Science and the Arts."

The invited lectures reflected the diversity of the topics covered. J. E. McGrath, Virginia Polytechnic Institute and State University, Blacksburg, VA discussed the "Synthesis of High Performance Polymeric Matrix and Adhesive Materials Systems." Fluorine and phosphine oxide containing high performance thermoplastic and thermosetting polyimides have been prepared: they are either totally amorphous or semicrystalline.

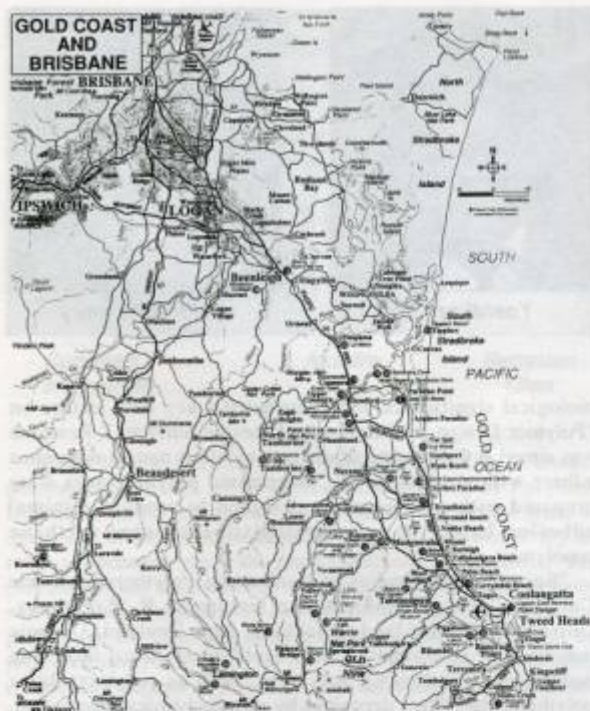
M. Kuramoto, Idemitsu Petrochemical Co. Ltd., Ichihara, Chiba, Japan described "Stereospecific Polymerization of

Styrene." Polystyrene of high syndiotacticity (m.p. 270 °C) has been synthesized with titanium compounds – methylmetallocene initiating systems. A number of titanium compounds are active but have various activities and give syndiotactic polystyrenes that crystallize rapidly and are of relatively narrow MW distribution. All three types of polystyrenes can now be synthesized, isotactic polystyrene with typical Ziegler Natta type and atactic polystyrene with radical initiators.

Y. Okamoto, Nagoya University, Nagoya, Japan outlined the "Helix-Sense-Selective Polymerization of Methacrylates and Conformational Characteristics of the Polymers." Helix-sense selective polymerization of bulky triarylmethyl methacrylates has been accomplished with chiral anionic initiators. Optically active polymers with one-handed helical structures have been obtained and some of the polymers exhibited characteristic conformational transitions in solution.

Y. Imanishi, Kyoto University, Kyoto, Japan, presented the "Construction of Polypeptide Tertiary Structure by the Template-Assisted Synthesis." Design of artificial proteins uses template molecules by which the spatial arrangement of the peptide fragments with the secondary structure is regulated to construct the super-secondary or tertiary structure. Cyclic peptides were used as the template molecules. Two basic alpha-helical peptides were designed to associate together to mimic a class of transcriptional regular proteins which bind to DNA.

K. B. Wagener, University of Florida, Gainesville, FL contributed to the very popular session on synthesis with his lecture on "Structure Reactivity Relationship in Acyclic Diene Metathesis Polymerization." High molecular weight polymers have been synthesized via acyclic diene metathesis reaction of



nonconjugated dienes. This polymerization reaction gave unsaturated polymers with ethylene as the side product. The rules were established which showed under which conditions the polymerization occurred and when not. It depended on the position of the substitution of the structure of the diene.

Among the several invited lectures on conducting polymers was that from H.S.O. Chan, National University of Singapore, Kent Ridge, Singapore, on "Disubstituted Poly(bithiophene)s: Synthesis and Applications." Poly(bithiophene) film coated on indium tin-oxide glass plate was used to detect low levels of ascorbic acid based on changes in the UV-visible absorption characteristic of the doped polymer.

Y. Chujo, Kyoto University, Kyoto, Japan contributed to the synthesis symposium with his paper on "Hydroboration Polymerization." Hydroboration is a well-known tool in organic synthesis, which takes place under mild conditions to produce various alkylborane compounds quantitatively. The polymerization reaction of the hydroboration between diene and hexylborane, the formation of poly(cyclodiborazane)s and the haloboration polymerization to form the first polymeric superacids were discussed.

J. C. Jung, Pohang Institute of Science and Technology, Pohang, Kyungbuk, Korea, discussed "Rigid Rod Polyimides with n-Alkoxyethyl Side Branches." Rigid-rod polyimides with regularly substituted flexible side chains are known to have excellent thermal stability. New pyromellitic, benzophenone-tetracarboxylic and naphthalene-tetracarboxylic polyimides with n-alkoxyethyl side chains were synthesized and studied.



James H. O'Donnell



David J. T. Hill

S. Tantayanon, Chulalongkorn University, Bangkok, Thailand presented her work on the "Synthesis of Poly(p-epoxystyrene-co-N-phenylmaleimide-co-styrene)." Polymers containing the epoxide group are one of the interesting negative electron-beam resists which play an important role in microlithography. Since thermal stability of the resist was desired in the processability of microelectronic manufacture the glass transition temperature of the poly(p-epoxystyrene-co-styrene) was increased by incorporating N-phenylmaleimide into the polymer.

V. L. Dang, National Center for Natural Science and Technology, Hanoi, Vietnam described the "Production, Modifications and Applications of Chitosan in Vietnam." Of the important natural polymers, chitin is second only to cellulose in natural abundance. Chitin is isolated from crustacean shells and chitosan is prepared from the chitin by N-deacetylation with alkali. An efficient process was described for the production of various derivatives of chitin and chitosan and some applications of chitosan. Chitosan is biocompatible, biodegradable, inactive as an antigen, active as an immunoadjuvant and non-toxic even by intravenous administration.

R. G. Gilbert, Sydney University, Sydney, NSW, Australia led a forum on polymerization kinetics and lectured on the "Measurement and Meaning of Rate Coefficients Controlling Molecular Weights in Free-Radical Polymerizations." Molecular weight distribution in a free-radical polymerization is controlled by the rate coefficients for radical creation from initiator, propagation and chain-stopping events. Termination may be by recombination, disproportionation and chain transfer. Predictions of the molecular weight distribution can be carried out from knowledge of these rate coefficients.



Gold Coast

Conference Report



Jupiters Casino and Conrad International, Gold Coast, Queensland

I. D. Jenkins, Griffith University, Nathan, QLD, Australia outlined "Some Recent Developments in the Aminoxyl Radical Trapping Technique." Free radical polymerization involves the reaction between an initiating radical and a monomer to produce a carbon-centered radical, which then adds to a second monomer to produce a new carbon-centered radical. It has now been possible to identify the structures of the first formed carbon-centered radical. These studies have revealed a rich variety of first generation radicals, which rely on the diffusion controlled trapping of carbon-centered radicals by stable aminoxyls to form stable alkoxyamine products.

J. Economy, University of Illinois, Urbana, IL, gave a presentation on "ITR, a New Concept in Polymer Processing." Interchain transesterification reactions were studied as a tool for facilitating processing of high performance polyesters. Liquid crystalline copolyesters based on p-hydroxybenzoic acid and 2,6-hydroxynaphthoic acid formed polymers which are capable of forming good high temperature adhesive bonds to metal substrates.

A. L. Logathetis, Du Pont Co., Wilmington, DE, outlined the "Developments in Perfluoroelastomers: Chemistry, Properties and Applications." Perfluoroelastomers are speciality products representing less than 1% of the total fluoroelastomer market, which is dominated by vinylidene fluoride based copolymers. These perfluoroelastomers are copolymers of tetrafluoroethylene and perfluoroalkyl vinyl ethers (20–40%) and completely amorphous. A third monomer (0.5–1%) is added to make these polymers crosslinkable. Two techniques are used: C-H Bond as Crosslinking Functionality and Crosslinking by High Energy Radiation.

I. Abdullah, University Kebangsaan Malaysia, Bangi, Malaysia, discussed "Liquid Rubber: Preparation and Application." Liquid rubbers are a class of elastomers or elastomer precursors that can be pumped or poured at room temperature or slightly above. Commercially available liquid natural rubber can be prepared by extensive mastication in air which is a mechanochemical oxidation of the radicals generated during mastication. Liquid natural rubber can be easily modified by chlorination by maleic anhydride addition for paints and adhesives.

K. J. Wynne, Office of Naval Research, Arlington, VA, organized a special session on functional polymer surfaces of



Yoshikazu Ito



Peter J. Pomery

biological significance and contributed a key note lecture on "Polymer Design for Minimally Adhesive Surfaces." Research was aimed at the creation of surfaces to which marine organisms adhere with great difficulty. Segmented polyurethanes were prepared with soft segments designed to produce minimal adhesion based on polydimethylsiloxane-urea-urethane copolymers.

"Spectroscopic Studies of Conducting Polymers on Oxide Catalysts" was the subject of a lecture by R. P. Cooney, University of Auckland, Auckland, New Zealand. Organic polymers are renowned for their excellent electrical insulating properties. Conducting polymers, such as polypyrrole or polythiophene, when deposited by electrochemical deposition, have a relatively disordered crosslinked structure. One solution to this problem is to synthesize conducting polymers within the confines of a zeolite channel, which was facilitated by the presence of cations such as copper with a high oxidizing power.

J. W. White, The Australian National University, Canberra, ACT, Australia, described "Structure of Polymeric Surfactants at the Air-Water Interface by Specular and Off-Specular Neutron Reflectivity." Specular reflection of radiation from the air-film-water interface leads to information about the film thickness and densities in the direction normal to the surface. The presence of a pattern of scattering length density in the plane of the interface can produce off-specular reflections, which is creating interest both in the case of x-rays and neutrons.



**Van Luyen
Dang**

**Stella
O'Donnell**



**Supanan
Tantayanon**

**Akihiro
Abe**

**Renyuan
Qian**

M. A. Winnik, University of Toronto, Toronto, ONT, Canada, presented his work on "Fluorescence Studies of Polymer Diffusion Across Interfaces." Latex films were formed when a dispersion of latex microspheres in water was allowed to dry at room temperature above the glass transition temperature of the polymer. When microspheres contain polar substituents at their surface, these substituents can get trapped between adjacent particles in the film. The polar groups can serve as a barrier to polymer interdiffusion in the film, or if the membrane components can act as plasticizers for the matrix polymer, it can serve to enhance the diffusion process.

P. Pincus, University of California, Santa Barbara, CA, lectured on "The Interactions Between Polymers and Membranes." The behavior of amphiphilic molecules in solvents may act as surfactants to self-assemble into sheetlike surfactant bilayers which have been studied as model systems for biological membranes, for chemical delivery, surface protective coatings or sensors.

S. Amiya, Kuraray Co. Ltd., Kurashiki, Japan discussed "Recent Advances in the NMR Characterization of Polymers." Poly(vinyl alcohol) and poly(vinyl acetate) have been studied by NMR spectroscopy especially two-dimensional spectroscopy for their tacticity, sequence distribution, end-groups, short chain-branching, 1,2 glycol linkages (head to head placements of the monomer) and polyene structure representing the loss of water from the polymer structure.

K. Horie, University of Tokyo, Hongo, Tokyo, Japan, presented his work on "Charge-Transfer Fluorescence and Photochemistry of Aromatic Polymers." Polyimides have become very important insulation materials in the microelectronic field. Intermolecular charge-transfer fluorescence of aromatic polyimides is sensitive to molecular aggregation and is also useful for monitoring thermal imidization and evaluation for the miscibility of polyimide blends. The charge-transfer fluorescence of aromatic polyimides and liquid crystalline polyesters as well as the improvement of photoreactivity of photosensitive polyimides were examined.

The paper by Jong-Kee Yeo, Lucky Ltd. R & D Research Center, Taejeon, Korea, "Sol-Gel Processed SOG Materials and Their Properties," was presented by his colleague Dr. Park. The fabrication of semiconductor chips with ultra large scale integration has been heading toward higher integration and



**Ezio
Rizzardo**

**Motowo
Takayanagi**

smaller size, which inevitably requires multiple metallization layers and interlevel planarization with dielectric materials. The spin-on glass films technique is widely used. Hydrolysis and condensation reactions of silane monomers were used for the deposition technique. Basic film properties were examined after curing the SOG coated films.

G. L. Wilkes, Virginia Polytechnic Institute and State University, Blacksburg, VA, presented an elegant study of the "Synthesis/Structure and Property Behavior of Inorganic Organic Network Materials." Appropriately functionalized organic species (polymers, oligomers and low molecular species) in conjunction with additional metal alkoxides through the use of the well known "sol gel scheme" were used for making high purity ceramics from alkoxide species as well as interesting network materials.

H. Bu, Fudan University, Shanghai, China, gave his view of the "Single Chain Single Crystal." Separation and observation of amorphous single-chain polymers have been achieved for a few non-crystalline polymers. A new method has now been developed that makes use of monomolecular patches on a liquid surface for the crystallization of single chain single crystals of poly(ethylene oxide) and isotactic polystyrene.

G. Shi, Shanghai Institute of Organic Chemistry, Shanghai, China, lectured on "Recent Studies on beta-Crystalline Form of Isotactic Polypropylene." Isotactic polypropylene shows four distinguishable chain conformations each being a 3/1 helix. Different packing geometries lead to three well known crystalline structures (polymorphs) namely the monoclinic alpha-form, the hexagonal beta-form and the triclinic gamma-form. The appearance of these structures is critically dependent upon the crystallization conditions. Among the three crystalline structures, the monoclinic alpha-form is by far the most common. It is the normal melt-crystallized and solution crystallized form. The beta-form and the gamma form were considered laboratory curiosities. Only few nucleating agents induce the production of beta-polypropylene. It has been found



Takeshi Takehiko

that dibasic acids, such as pimelic or azelaic acid salts of the group II elements, calcium, magnesium or barium, added as oxide or hydroxide acted as excellent nucleating agents for beta-polypropylene crystallization.

S. Kitayama, Sumitomo Chemical Co. Ltd., Tsukuba, Ibaraki, Japan, described "A Novel Polymer Film That Controls Light Transmission." This novel light control film changes appearance from translucent to opaque, depending on the angle with which it is viewed. This phenomena is caused by the microstructure that is formed during photopolymerization. The composition of the light controlled films is composed of at least two photopolymerizable monomers of oligomers having different refractive indices and reactivities.

The theme of intelligent polymers was addressed by G. G. Wallace, University of Wollongong, Wollongong, NSW, Australia, in his talk on "Performance on Demand - A New Era in Polymer Science." Numerous emerging technologies involving the use of polymers place ever increasing demands on the capabilities of materials. In the development of new sensors the active polymer must be able to recognize certain ions or molecules, interact with them and then release them. These application areas rely on the ability to call particular properties of the polymer system into play when they are required. They must perform on command each time! Several application areas for conducting polymers were discussed: Conducting Electroactive Polymers; Controlled Release Technologies; Separation Technologies; New Biosensing Technologies.

A. Natansohn, Queen's University, Kingston, ONT, Canada, Canada's Councillor to the PPF, discussed "Reversible Optical Storage in Azo Polymers." Amorphous polymers containing aromatic azobenzene groups bound within the polymer structure can be used for reversible optical storage. The process is based on photochemical Trans-cis-trans isomerization cycles and the "written" state is an induced supramolecular order, while the initial state as well as the "erased" state are amorphous and disordered. This supramolecular organization is obtained by

selective polarization of the laser light for "writing."

In considering the problem of fabrication of conducting polymers, S. Miyata, Tokyo University of Agriculture and Technology, Koganei, Tokyo, Japan, described the preparation of "Highly Electrical Conducting Polymer Alloys." This involved casting films of poly(vinyl acetate) and pyrrole with ferric oxide as oxidant. The polymerization of pyrrole occurred as the oxidation potential increased on solvent evaporation.

C. Y. Kim, Polymer Materials Laboratory, KIST, Seoul, Korea, described "In Situ Spectroscopy of Redox Reaction in Polypyrrole." Polypyrrole formed by electrochemical polymerization is regarded as a stable material but undergoes significant changes under application conditions. Visible spectroscopy and FT-Raman has been used to study these changes and the cause of degradation.

S. C. Kim, Department of Chemical Engineering, KAIST, Taejeon, Korea presented his work on the "Application of Interpenetrating Network Materials." Hydrophilic-hydrophobic IPN membranes obtained by sequential polymerization to form poly(styrene-co-acrylonitrile) and polyacrylic acid were shown to have enhanced separation of ethanol and water from 20% aqueous ethanol solutions. Hydrophilic-hydrophobic IPN's based on polyurethane chemistry were also prepared and showed good blood compatibility.

T. Ogawa, Universidad Nacional Autonoma de Mexico, Coyoacan, Mexico, discussed the "Synthesis and Characterization of Some New Polydiacetylenes." A few new polyamide based diacetylenes were synthesized, cast and polymerized by topochemical cross-polymerization on irradiation or heating to give deep bluish transparent films. Small modifications in the chemical structure changed the polymerizability.

M. Jaffe, Hoechst Celanese Research Division, Summit, NJ, provided "New Insights in the Structure-Property Relationships of Thermotropic Polyesters." Thermotropic copolymers of p-hydroxybenzoic acid, isophthalic acid and hydroquinone have been investigated as a model for process-structure-property relationships of nematogenic copolymers. Both thermal and mechanical properties are sensitive to the ordering of the 'mers' in the molecular backbone.

S. Fujishige, Tokyo Kasei University, Itabashi, Tokyo, Japan, presented "A New Family of Water-Soluble Polymers of N-Substituted Acrylamide Derivatives." A series of water soluble polymers were synthesized from N-substituted acrylamides and methacrylamides and their solubility properties studied, together with that of the N-propyl derivatives by viscometry, light scattering, NMR and DSC.

W. H. Daly, Louisiana State University, Baton Rouge, LA, showed the advantages of "Enhancing Reinforcing Effects of Polymers in Asphalt; an Applied Approach to Solid Waste Disposal." Blends of polymeric materials with asphalt are complex and characteristically unique paving materials. The physical properties of asphalt polymer blends are affected by the amount of polymeric material added, its composition, its molecular weight, but most important, is the compatibility of the asphalt-cement with the admixed polymer.

H. B. Lee, Korean Research Institute of Chemical Technology, Taejeon, Korea, discussed his work on "Cell Adhesion and Protein Adsorption on Gradient Surfaces." Detailed analysis of surface-induced changes of adhered cells or

adsorbed proteins requires a series of well characterized surfaces, each having a constant chemical and physical property. Chinese hamster ovary cells as a model system and human albumin as a model protein were studied. Wettability gradients occur because hydrophobic interaction of the protein molecules with the hydrophobic section of the gradient surface seems to be important.

P. J. Carreau, CRASP Ecole Polytechnique de Montreal, Quebec, QUE, Canada, described the "Rheological Properties of Blends: Facts and Challenges." Three forces will continue to provide incentive for the industry to produce new polymer blends: the ability to tailor product properties to a particular performance cost balance; fast entry into new markets; and it is easier to develop products for small or niche markets than by synthesizing new polymers. The rheological behavior of blends is complex and depends in a complex manner on the properties and components of the constituents.

T. Nose, Tokyo Institute of Technology, Ookayama, Tokyo, Japan, outlined the "Kinetics of Phase Separation of Polymer Blends." The coexistence curve is an indispensable information for studying phase separation kinetics. It describes the stability and the fractional phase-volume of the systems. Experimental difficulties have now been overcome and it is now possible to determine precisely the coexistence curves of polymer blends.

W. H. Jo, Seoul National University, Seoul, Korea, presented "Morphology Control in Immiscible Polymer Blends." Many miscible polymer blends have been developed, still there is a substantial amount of interest in the structure and properties of immiscible polymers blends. Coarse phase dispersion and coalescence together with poor adhesion between phases are the limiting factors in all applications. Many immiscible polymer pairs have been compatibilized by the addition of a third component such as graft or block copolymers. Several examples have been studied.

D. J. Carlsson, National Research Council of Canada, Ottawa, ONT, Canada, led the symposium on polymer degradation with a paper on "Degradation of gamma-Irradiated Polyolefins: Oxidation and Stabilization." The gamma-ray irradiation of solid polyolefins leads to random bond scission and the generation of radicals. A combination of infrared, derivatization infrared and electron spin spectroscopies and physical testing has been used to explore the reaction intermediates in the presence and absence of novel stabilizer mixtures. This has led to a comprehensive view of the gamma-ray initiated degradation process and the mechanisms by which new highly effective stabilizers may function.

M. R. Binns, BHP Steel, Research and Technology Center, Port Kembla, NSW, Australia, described "New Techniques for the Early Detection of Polymer Degradation." Most degradation studies use the accelerated testing of materials. A newer approach of apparently good reliability of "Sensitive Monitoring of Natural Degradation," tries to isolate the individual degradative processes that occur in a natural environment.

D. J. Liaw, National Taiwan Institute of Technology, Taipei, Taiwan, discussed "Surface Photodegradation and Modification of Some Substituted Polyacetylene Films." Electroactive conjugated polyacetylenes have attracted a great deal of attention because of their interesting electrical/electronic properties. Substituted polyacetylenes are thermally more stable than polyacetylene in air, and their thermal stability increases with



Tom Spurling

increasing number and/or bulkiness of the substituents. In this work the surface photo-stability and degradation behavior of such polymers was studied especially the surface modification and degradation of polyacetylene films with heteroatoms as the substituents.

B. A. Bolto, CSIRO Chemicals and Polymers, Clayton, VIC, Australia, reviewed the role of "Polymers in New Water Treatment Technologies." Improved methods of cleaning up water and waste water by processes based on adsorption and coagulation phenomena have been developed. The initial work on ion exchange for desalination, using resins which could be regenerated with hot water rather than chemicals led to the emphasis on high-rate systems, both for the reaction step and for the separation of the absorbed or accumulated impurities from the purified water.

C. C. Ho, University of Malaya, Kuala Lumpur, Malaysia, described the "Novel Application of Natural Rubber Latex as Natural Flocculant for Tin Tailing Slurry." Natural rubber latex concentrate is essentially a dispersion of negatively charged polyisoprene particles in an aqueous serum phase containing some minor constituents of soluble non-rubbers whereas tin tailing slurry is a very stable dispersion of mainly submicron size clay minerals with some heavier silt particles. It was found that rubber latex in combination with calcium chloride under optimum conditions is an excellent polymeric flocculant giving complete heterocoagulation producing a clear supernatant and a porous sediment.

N. M. Surdia, Institute of Technology, Bandung, Indonesia, lectured on "The Interaction of Additives in Polyblends of Starch and Synthetic Polymers." Polyblends are used in plastics waste management by biodegradation. To undergo biodegradation, the blends should be compatible. In order to obtain a compatible blend, additives are frequently added. These additives can follow different mechanisms of degradation, i.e. chemical reaction, acid base interaction, physical adsorption or adhesion.

Among the contributed papers, one which was particularly interesting was a paper by a daughter/father team, Catherine L.

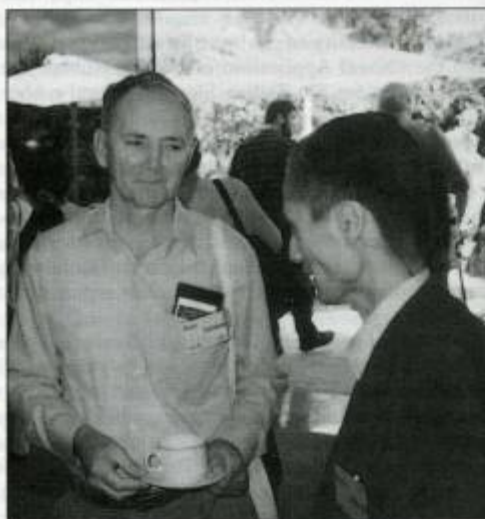
Conference Report

Winzor and Donald J. Winzor, on the "Use of Analytical Ultracentrifugation to Evaluate Scission and Crosslinking Yields for Irradiated Polymers."

One of the highlights of Pacific Polymer Conferences, first initiated at the First Pacific Polymer Conference, is a session on "Polymer Science and the Arts." PPC-3 was no exception. An entire day was devoted to this subject which included preservation, restoration, and stabilization of objects of polymeric nature or by using polymers or polymeric materials.

O. Vogl, Polytechnic University, Brooklyn, NY, described his interest in "Oriental Lacquers." The varnish tree "*Toxicodendron vernicifluum*," also called "*Rhus verniciflua*," is the common source of Japanese lacquer. The sap of the Japanese lacquer tree consists of about 65% of the oily phase urushiol and an aqueous phase, containing polysaccharides, gums and enzymes, necessary for curing the lacquer. The active ingredients in the urushiol fraction are catechol derivatives substituted in the 3-position with saturated and unsaturated C-15 carbon chains. A novel combination of modern techniques have been applied for the accurate analysis of the individual components of urushiol. UV stabilizers have also been prepared for oriental lacquers. Finally the speaker also showed slides of oriental lacquerware made by the various techniques.

H. Misawa, University of Tokushima, Kyoyo, Japan, presented his work on the "Optical Harmony of Polymeric Microspheres in Solution." Microspheres, such as polymer beads, oil droplets, capsules are known to undergo vigorous Brownian motion in solution. The Brownian motion is a random process and we cannot see any *harmony* in the movement of microspheres. A principal key to produce harmony in microspheres and to select and manipulate individual spheres is the *radiation force of light*. It can act as the driving force for trapping and manipulating of the spheres. This talk concluded with an excellent video showing the laser manipulation of the microspheres.



David H.
Solomon

Koichi
Hatada



J. M. Lyall, National Library of Australia, Canberra, ACT, Australia, has a major interest in "Preserving Polymers for Posterity." It is usually accepted that the responsibility for preserving our cultural heritage resides in museums, galleries, libraries and archives. Craft skills of restorers were employed to preserve important materials in public and private collections. As materials are becoming more complex in the 20th century the skills of the restorer require also knowledge of material science. A number of factors need to be considered: Occurrence of polymers in cultural materials; ethical considerations, obsolescence, altering deterioration reactions, effects of conservation treatment and reaction during storage. These considerations must be undertaken with the understanding that resources for this type of work are limited.

D. H. Solomon, University of Melbourne, Melbourne, VIC, Australia presented a history of "Polymers and Money." The Australian \$5 and \$10 banknotes, as well as the \$10 bicentennial banknote, are a sandwich structure, made of oriented polypropylene with a very special emblem that makes the banknotes essentially impossible to counterfeit. They have to have the feel of paper to make them acceptable to the public. The banknotes are expected to have lifetimes more than three times that of present day notes. Australia is now producing plastic based banknotes for several countries. Solomon described the history of the development of a technology that was necessary for the creation of these banknotes.

The 3rd Pacific Polymer Conference had several highlights in addition to the scientific agenda. On Sunday evening there was an informal cocktail party for the participants. The Monday noon was reserved for a Welcome Luncheon for all of the delegates. Wednesday was an important event on the beautiful beach south of Surfer's Paradise with a traditional "Aussie Barbeque." On Thursday evening was the memorable Banquet with the performance of an Aboriginal Dance Group. On the occasion of the banquet, the first awards of distinguished service for Polymer Science in the Pacific Region were awarded to the first and second Presidents of the Pacific Polymer Federation, Professors Otto Vogl and Takeo Saegusa.

At the Departing Luncheon on Friday for all participants, it was concluded that our Australian hosts of the PPC have been exceptional hosts for this conference. This meeting has solidified the stature of the PPF and recognized the importance of cooperation in polymer science in the Pacific Basin.



Aborigine Dance

Great progress was made in the further development and enlargement of the PPF. Several organizations had applied to be admitted to join the Federation. Polymer organizations from Thailand, Taiwan, Indonesia, Mexico and Vietnam were admitted as new members of the PPF at the Council Meeting.

At the end of the meeting the Presidency of the PPF was handed over from the Australian organization to the American side. The Americans will be responsible for the leadership of the organization and the next conference of the Pacific Polymer Federation. The site for the next conference has been selected and PPC-4 will be held in Kauai, Hawaii in December 1995. It has been decided to hold PPC-5 in Korea in 1997 with Korea as the host country, during which time the presidency of the PPF will be held by a Korean.

Conference Report

Fourth Pacific Polymer Conference: Koloa, Kauai

Jane C. Vogl and Otto Vogl

Polytechnic University, Brooklyn, NY 11201

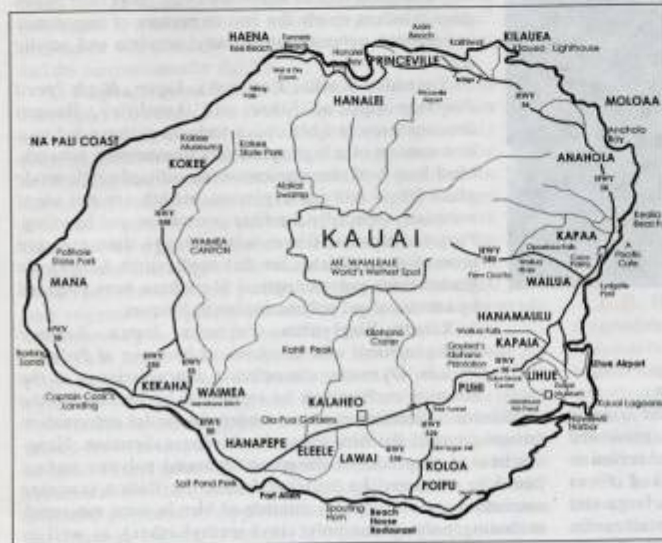


The Fourth Conference of the Pacific Polymer Federation (PPF) was held from December 12 to December 16, 1995 on the Hawaiian island of Kauai at the Hyatt Regency Kauai Beach Resort on Poipu Beach in the town of Koloa on Kauai. The First Pacific Polymer Conference (PPC-1) was held at the Royal Lahaina Resort on Kaanapali Beach Resort in Maui, Hawaii in December 1989 [Polymer News 15(6), 191-195 (1990)], PPC-2 was held in Otsu, Japan in December of 1991 [Polymer News, 17(6), 185-191 (1992)], and PPC-3 on the Gold Coast of Australia in December of 1993 [Polymer News, 16(7), 216-223 (1994)]

PPC-4 was held under the Chairmanship of **Joseph C. Salamone**, then the President of the PPF. Raffael M. Ottenbrite served as the Program Chairman and William H. Daly as the Treasurer. The International Advisory Committee was chaired by Otto Vogl, the first President of the PPF.



Joseph C. Salamone, President of PPF



Kauai, the Garden Isle

The Conference had nearly 700 participants from 34 countries, with the US, Japan and Korea represented by over 400 participants, 45 students also participated at PPC-4. Many wives and families also attended, particularly from Japan, and at the *Luuu*, the traditional Hawaiian "cook-out", nearly 750 people were present.

The scientific program consisted of nearly 600 contributions: 3 plenary lectures, 25 invited lectures, nearly 400 contributed papers, 165 contributions were presented in poster form.

The program was opened with a plenary lecture by **Joseph A. Miller**, the Chief Technical Officer of the DuPont Company, Wilmington, DE, USA, entitled: *Polymers for the 21st Century—an Industrial Perspective*. This lecture was followed with a lecture by **Tadasu Tachi**, Chairman of the Board, Kaneka Corporation, Osaka, Japan representing R&D in Japanese Polymer Industry, entitled "My Research Life at the Kaneka Corporation". The final of the three plenary lectures was by **Youn Sik Kim**, Vice President of Yukong Ltd., Taejeon, South Korea with a talk on "The Prospects of Polymer Industries in Korea".

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Otto Vogl Takeo Saegusa Jane C. Vogl Joseph A. Miller

The scientific program of PPC-4 was divided into a number of Symposia, reflecting various subjects of polymer science and technology: *Polymer Synthesis; Adhesion Science; Surfaces and Interfaces; Enhancement of Polymer Properties; Biorelated Polymers; Emulsion, Suspension and Dispersion Polymerization; Mechanical Behavior of Polymer Blends; Membrane Technology; Olefin and Olefin Catalysis; Polymer Degradation and Stabilization; Polymers for Advanced Optical Applications; Water Borne Coatings and Multifunctional and Smart Materials.*

The following **Invited Lectures** were presented:



Hyatt Regency Kauai Beach Resort,
Poipu Beach, Koloa, Kauai

Alan N. Gent, Akron, Ohio, USA, *Autohesion and Strength of Crosslinked Polyethylene*. Two identical sheets of crosslinked polyethylene were hot pressed in the molten state and cooled to room temperature. The adhesion was measured and it was concluded that the adhesive fracture energy was large and comparable to the tear strength caused by co-crystallization across the interface. The enhanced strength in hot-melt adhesion

and in resistance to tearing and cutting is larger than could be accounted for on a molecular basis.

Robert R. Gagne, San Dimas, CA, USA, *Poly-X™ SRP Polyphenylenes. Self-Reinforced Polymers*. Poly-X™ SRP's are a family of rigid-rod, poly-*para*-phenylenes featuring benzenes in the polymer backbone with side chain substituents. The substituents serve to provide solubility and melt processibility. Derivatives that have keto side chains have been most extensively studied and gave the best results. The SRP series exhibit high modulus, high strength and excellent solvent resistance as well as hardness. They are thermoplastic with moderate glass transition temperature and can be fabricated using conventional compression molding, injection molding and extrusion techniques.

Samy El-Shali, Richmond, VA, USA, *From Gas Phase Clusters to Polymers and Nanoparticles. A Route to Novel Materials*. Intracuster cationic polymerization reactions possess a distinct form of chemistry that have not been previously explored. In the gas phase at low pressure eliminative polymerization may predominate. However, in the same system at high pressures, the ionic intermediates may be stabilized and addition without elimination may occur. The competition between the condensation reaction and monomer evaporation can control the ultimate size that the polymer can reach in the cluster.

Robert G. Gilbert, Sydney, Australia, *Measurement of Propagation Rate Coefficients for Emulsion Polymerization Modeling*. Mechanistic understanding and modeling of emulsion polymerization requires a knowledge of the propagation rate constant k_p . The relatively new technique of pulsed-laser polymerization (to photo-initiate with a pulsed laser) has been found to give reliable k_p values. Measurements at very low temperatures and/or with very short laser pulses gave excellent results for two monomers of importance in emulsion polymerization: butyl acrylate and acrylic acid.

Yasuhiro Koike, Kawasaki, Japan, *High-Speed Polymer Optical Fiber and Amplifier*. Recent developments in fiber optics technology have led to a new concept of a high speed data transmission network. Most long haul communication has utilized single-mode glass fiber, inorganic glasses, which are not ideal materials, especially for fiber connection and handling. Polymer optical fibers with a large diameter are promising candidates for this application. Large-core graded-index polymer optical fibers have been prepared by interfacial-gel polymerization techniques.

Tisato Kagiya, Fukuoka, Japan, *Surface Topographical and Mechanical Imaging of Polymer Blends*. Dynamic viscoelastic characteristics at the outmost surface can be evaluated by measuring the cantilever deflection (response) under sinusoidal deformation (stimulation) of the film along the thickness direction. Nano-mechanical properties of the phase separated polymer surface could be measured by utilizing forced oscillation scanning viscoelastic microscope. A number of blends were measured, including polystyrene/poly(vinyl methyl ether), as well as organosilane monolayers.



Stephan Z. D. Cheng, and Frank W. Harris, Akron, OH, USA, *Aromatic Polyimides in Optical Applications*. For many years it has been recognized that "in-plane" orientation of wholly aromatic polyimides exist in film form. On the basis of over one hundred organo soluble polyimides it was established that the degree of "inplane" orientation was critically associated to the film thickness and the macromolecular rigidity.

Y. Tsujita, Nagoya, Japan, *Gas Transport Properties of Polyimides with Rigid Side Chain*. Gas transport properties and molecular structure of alicyclic and aromatic polyimides with rigid side chains were correlated. The density, sorption isotherms and permeability coefficient for various polyimides were measured. The highly ordered structures and the gas permeation properties were influenced by rigid side chains. It was concluded that the rigidity and linearity of the main chain are important factors to control the gas permeability and the main chain and segmental rigidity should be restrained to provide simultaneously increased permeability and permselectivity.

Yoshio Imai, Tokyo, Japan, *New Synthetic Methods for Polyimides and Related Condensation Polymers by High Pressure Polycondensation and Microwave Assisted Polycondensation*. High pressure polycondensation has been known for over two decades for the formation of such polymers as nylon-11 and nylon-12. This method has been found to be also successful for the synthesis of aliphatic-aromatic and "all" aromatic polyimides. Applications of microwave techniques have recently become of interest in organic synthesis as well as in radical polymerization and curing reactions. Microwave

assisted polycondensation has now also been utilized for the formation of polyamides and polyimides.

H. K. Mahabadi, Mississauga, Ont, Canada, *A Novel Particulate Polymerization Process*. Polymeric and polymeric composite particles are used in a variety of applications including paints and dry coatings. This market requires products with specific properties and heterogeneous polymerization recipes and processes have been developed. A new heterogeneous process fulfills these demands. It involves the preparation of a mixture of monomer, polymer, initiator and other ingredients; the mixture is suspended and is then polymerized to complete conversion.

N. Peyghambarian, Tucson, AZ, USA, *Efficient Photorefractive Polymers*. Photorefractivity is a special mechanism for producing a hologram in an optically nonlinear material. It was first observed in lithium niobate many years ago. Photorefractive polymers emerged as an alternative, but their performance is limited. The most effective ones are composites based on the photoconducting polymer host poly(N-vinyl carbazole).

Junzo Sunamoto, Kyoto, Japan, *Reconstruction of Artificial Cell Wall on Carrot Protoplast Using Hydrophobized Polysaccharide*. The behavior of naturally occurring polysaccharides which are "hydrophobized" in part with cholesterol are capable of coating and interacting with many natural environments including artificial cell walls and liposomes.



Waimea Canyon

J. H. Hodgkin, Clayton, Vic, Australia, *Environmental Degradation Mechanisms in Commercial Thermoplastic Polyesters*. Polymeric materials are used for many critical engineering applications such as in oil exploration. Cost is an important factor but "replacement" costs can overcome the initial outlay. Testing methods have been developed for the characterization and endurance of polyesters for umbilical hoses in undersea oil wells, and naturally aged rope samples.

R. S. Irwin, Wilmington DE, USA, *Effects of Twisted Monomers on Aramid Properties*. The strength of poly-para-phenyleneterephthalamide fibers is largely determined by the degree of macromolecular alignment in the lyotropic spin dope

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as extruded through a spinneret, and how well this is captured in coagulation to form fibers. The observed strength is much lower than calculated. A mechanism has been put forward to involve the twisting and untwisting of the plane of the macromolecules at the phenyl-phenyl bond and concomitant chain to explain this behavior.

B. Z. Jiang, Changchun, China, *On Toughening Mechanism of Polymer Blends*. Two aspects of the toughening mechanism of polymer blends emphasize the critical interparticle distance and cavitation. In agreement with this hypothesis it was found that the critical interparticle distance was related to the product of the yield strength, to the measuring temperature (T_p) of the matrix, and the impact strength of the polymer blends.



Poipu Beach

Kazuo Soga, Ishikawa, Japan, *Recent Progress in Heterogeneous Metallocene Catalysts*. Metallocene catalysts have revolutionized the polymerization of α -olefins. The molecular design of the metallocene ligands has yielded a variety of highly efficient catalysts. The new approach is to prepare various supported metallocene catalysts, based on silica, aluminum oxide, magnesium chloride, polystyrene beads, and heteropolyacids as carriers and use them as catalyst systems for olefin polymerization. The objective is to control polymer morphology of the polymers obtained in these polymerizations, reduce the amounts of MAO, or replace it with ordinary AlR_3 , and improve the extent of catalyst isospecificity.

R. Shashidhar, Washington, DC USA, *Structure and Electro-optic Properties of Ferroelectric Liquid Crystalline Polymers*. The relationship of structure and electro-optic properties of different types of ferroelectric liquid crystalline polymers were investigated. Layer structures were prepared. It was found that the thin film structure attains a bulk-like structure after 6 layers. Pyroelectric properties of a number of terpolymers were silicone polymers with one non mesogenic and two different mesogenic units attached to the polymer backbone. This combination leads to an unusual linear temperature dependence of polarization. In addition to linear silicone polymers as the attachment points for mesogen units, cyclic silicone were also used.

N. Ogata, Tokyo, Japan, *Intelligent Bio-Conjugate Polymers*. Stimuli responsive polymers such as temperature-responsive

polymers have been studied extensively. For instance, poly(N-isopropylacrylamide) is a water-soluble polymer with remarkable hydration-dehydration changes in response to temperature changes. This is caused by the transition behavior between hydrophobic and hydrophilic characters of the polymer which is caused by temperature. When the temperature sensitive poly(N-isopropylamide) is combined with biomaterials such as proteins or enzymes, novel polymers of "Intelligent Bioconjugates" can be obtained allowing a recycling system based on transition phenomena.

H. M. Gajiwala, Tuskegee, AL, USA, *Synthesis and Characterization of New Thermally Stable Processable Polyimides Based on the Semi-Flexible Mixed Aliphatic Aromatic Diamine*. New thermally stable processable polyimides based on semi-flexible mixed aliphatic-aromatic and alicyclic-aromatic monomers have been prepared. These materials show good thermal stability coupled with good processing characteristics.

S. X. Wang, Eindhoven, The Netherlands, *Thermodynamic and Structural Properties of Chain Lattice Fluids Calculated from Integral Equation and Perturbation Theory*. Thermodynamic and structural properties of pure polymers and polymer blends in a simple cubic lattice have been studied using the polymer reference interaction site model (PRISM) integration theory with the Percus-Yevick closure approximation and the mean spherical approximation. The results compare with those obtained from the Quasi-Chemical-Approximation as well as from Monte Carlo simulation data.

F. Garnier, Thiais, France, *Specificity and Limits of Organic-Based Electronic Devices*. Various devices based on organic semiconductors have been proposed; mainly, photovoltaic cells, light emitting electrodes and thin film transistors. The potential interests of this approach are generally expressed in terms of low cost, large area and flexibility of these devices, together with the easy control of the electronic and processing properties of the organic semiconducting materials, which can be achieved by subtle modification of their chemical structure. Long term stability of the organic semiconductors, under device operation, forms also a critical point for the relevance of organic-based devices. As the base materials studies of thiophene oligomers and sexithiophenes have been undertaken.

Y. T. Hwang, Taipei, Taiwan, *Study of Structural Effects on the Performance of Polyurethane Dispersions*. Polyurethane dispersions are attracting an increasing amount of attention in light of environmental concerns. Promoting wider acceptance of this water borne system requires a thorough understanding of its structure-property relationship. In addition hybrid acrylate polymers with polyurethane dispersions were also studied and gave interesting results.

H. K. Schmidt, Saarbrücken, Germany, *Electrochromic Systems Based on Multilayer Sol-Gel Processing*. Electrochromic devices have interesting properties like materials properties, electrochemistry and applications. The devices consist of transparent layers, each layer having very different functions. Special sol-gel electrochromic systems were developed, and applied by dip and spin coating. They can produce new transparent ionic conductors and combine conductivity with good mechanical properties.



Wailua Falls, Kauai

Many contributed papers were presented at this Conference; a selection is discussed briefly:

G. A. George, Brisbane, Qld, Australia, *Controlled Interfacial Adhesion in Low-Temperature Cured Phenolic Composites*. Plasma modification of extended chain polyethylene fibers/phenolic resin composites was found to have a marked increase in the interfacial adhesion. It was suggested that the increased adhesion is a consequence of the chemical bonding between the phenolic resin and the functionalized polyethylene surface.

Y. D. Lee, Hsinchu, Taiwan, *Synthesis, Characterization and Properties of Molecular Composites*. Molecular composites prepared by copolymerization or solution blending of an amorphous polyimide and a liquid crystalline polymer. Fibers were wet or dry-spun. Liquid crystalline textures were observed in the fibers produced from anisotropic solutions.

D. G. Baird, Blacksburg, VA, USA, *The Effect of Maleated Polypropylene on the Mechanical Properties of Blends of Polypropylene with Liquid Crystalline Polymers*. Maleic anhydride grafted polypropylene was blended with three liquid crystalline polymers, one polyesteramide and two co-polyesters. Maleic anhydride grafted polypropylene did not react with the liquid crystalline polymers, hydrogen bonding was believed to have compatibilizing effects of these blends.

H. G. Zachmann, Hamburg, Germany, *Relation between Mechanical Properties and Structure in Blends of Vectra A and Vectra B*. The blend components were thermodynamically immiscible but melt annealing, enhanced by stirring gave a single phase which is caused by transesterification.

Takashi Miyata, Suita, Osaka, Japan, *Microphase Separation in Graft Copolymer Membranes with Pendent Oligodisiloxanes and Permselectivity for Aqueous Ethanol Solutions*. Microphase separation was noticed, and permeation rates were effected by silicone content and the chain length of the pendent silicone side chain.

K. Nakamae, Kobe, Japan, *Surface Properties of Membrane Prepared by Glucosyloxyethyl Methacrylate Copolymers*. Polysaccharides exist in several forms in nature and play important roles in physiological actions. Copolymers of glucose derivatized methacrylates as comonomers introduced novel surface properties in polymer membranes.

B. Novak, Amherst, MA, USA, *The Direct Polymerization of Vinyl alcohol and Vinyl Alcohol Derivatives*. Attempts have been made to isolate the very unstable tautomer of acetaldehyde, vinyl alcohol, as monomer for the formation of poly(vinyl alcohol.) Copolymers were observed by photoinitiation of AIBN with maleic anhydride and acrylonitrile.

K. Wagener, Gainesville, FL, USA, *ADMET Chemistry in the Synthesis of Chlorofunctionalized Polymers*. High molecular weight polymers were obtained by acyclic metathesis polymerization which avoided acid catalyst systems, to give unsaturated polymers and ethylene.

H. R. Allcock, University Park, PA, USA, *Addition Polymerizations in Tunnel Clathrate Host Systems*. Spirocyclophosphazenes crystallize in the presence of organic molecules as hexagonal crystals that contain tunnels. The organic molecules could be monomers that were polymerized by γ -radiation and gave polymers and copolymers with polymer chains produced within the tunnels as individual polymer chains.

S. Nakahama, Tokyo, Japan, *Anionic Polymerization of Fluorostyrenes*. Anionic polymerization of 2-, 3-, and 4-fluorostyrenes at low temperatures with *sec.* butyllithium gave the respective polymers in quantitative yield.

F. Stelzer, Graz, Austria, *New Heterogeneous and Homogeneous Catalysts for ROMP*. New soluble, insoluble and supported metathesis catalysts were developed. As supporting media, amorphous magnesium chloride was found to be interesting. Molybdenum based chiral catalyst systems were developed and the polymerization of chiral cyclic olefins was investigated.

S. K. Tripathy, Lowell, MA, USA, *Bulk Self Assembled Films for Photonics*. Significant second harmonic generation from spin coated and bulk films was observed without recourse of poling. A second class of polymers with azo dye based NLO chromophores has been processed into optically holographic films. *Trans-cis-trans* isomerization driven reorientation and macromolecular motion led to the formation of surface relief grating upon exposure to an interference pattern.

T. Ogawa, Mexico, DF, Mexico, *Third Order NLO Susceptibility of Diacetylene-Containing Polymers*. Several polymers of aromatic and aliphatic diacetylenes were fabricated and showed third order NLO susceptibilities [$\chi^{(3)}$] in the order of 10^{-11} to 10^{-9} esu. Diacetylenes could also be mixed with transparent amorphous polymers and polymerized which gave

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polymers of microcrystals topochemically polymerized and homogeneously dispersed in the amorphous polymer.

P. N. Prasad, Buffalo, NY, USA, *Novel Polymeric Composites for Photonics*. Multi-component photorefractive systems for optical data storage applications have been prepared. The photorefractivity is a combination of the electro-optic effect and photoconductivity. Holographic diffraction efficiencies have reached up to 50% in these composites. Some of these materials were prepared by sol-gel processing of inorganic-organic composites.

K. J. Wynne, Washington, DC, USA, *Design, Synthesis and Nonlinear Optical Properties of Syndioregic Main Chain Chromophore-Containing Polymer Bilayers*. Systems have been developed where the chromophore is arranged in syndioregic architecture and has amphiphilic character determined by the binding groups. These "accordion polymers" could be poled to produce films with stable order nonlinear optical properties.

G. Lindsey, China, Lake, CA, USA, *New Chromophoric Glassy Polymers and the Fabrication of Thermally Stable, Second-Order Nonlinear Optical Films*. A similar system has been studied with the same chromophores but with the different linking groups. Hydrophilic and hydrophobic groups were attached to establish the most efficient way to establish the proper self assembly during film deposition.

Dang Van Luyen, Hanoi, Vietnam, *Preparation and Swelling of Polyelectrolyte Complexes*. Polyelectrolyte complexes have been studied over the years. Of recent interest was the complex of a naturally occurring polyamine carboxymethyl cellulose and a natural polycation chitosan, their swelling/shrinking behavior, and the use of such complexes in encapsulation technology.



Secluded Beach (Hanakappai Beach)

Y. Chujo, Kyoto, Japan, *Poly(organoboron halide)s by Hydroboration Polymerization*. By hydroboration of bromoborane dimethylsulfide complex with various α,ω -dienes,

polymers were obtained that were excellent polymeric Lewis acids.

B. Yamada, Sumiyoshi, Osaka, Japan, *ESR Studies of Radical Polymerization of Deuterated Monomers*. Radical polymerization cannot be followed by improved ESR techniques. Deuterated monomers have a smaller hyperfine structure of the radicals which brings about a spectrum of fewer lines. The polymerizations of deuterated styrene, deuterated in the phenyl ring and cyclohexyl methacrylate deuterated in the methacrylate portion of the molecule have been studied. The propagation rate constants were determined. Differences were noticed when the deuteration was in the "polymerizing portion" of the monomer, the vinyl double bond.

Shiro Kobayashi, Sendai, Japan, *Synthesis of Polyphenols via Enzymatic Oxidative Polymerization*. Enzymatic polymerizations have received considerable attention as a new methodology for polymer synthesis. A new type of polyphenols has now been synthesized by a peroxidase catalyst using hydrogen peroxide as oxidizing agent in aqueous dioxane. The polymer seems to be linear, partially soluble and of reasonable molecular weight; its structure consists of phenylene and oxyphenylene units.

J. E. McGrath, Blacksburg, VA, USA, *Enhancement of Properties via Incorporation of Hydrolytically Stable Aryl Phosphine Oxide*. A number of new polymeric systems have been synthesized that have as their essential element aromatic phosphorous bonds. They include polyesters, polyarylene ethers, polyamides and polyimides.

J. Kötzt, Potsdam, Germany, *Phase Behavior of Polyanion-Polycation Systems*. Phenomena of phase separation due to polyelectrolyte complex (simplex) formation between different polyelectrolyte components were investigated. The formation of stable simplex dispersions, flocculation, as well as coacervation processes were observed.

D. J. T. Hill, Brisbane, Australia, *Microwave and Thermal Cure Kinetics of Epoxy Resins*. Epoxy resin materials are widely used in the manufacture of composite materials. The materials are conventionally cured in industrial thermal autoclaves, which can result in the presence of thermal gradients in the material during the cure process. More recently, microwave heating, which depend on the energy absorption directly by the resin material has been investigated because it has the advantage that the intensity of the heat source can be more readily controlled by switching or pulsing. The general cure is quite similar whether done thermally or by microwave techniques.

D. Radić, Santiago, Chile, *Polymers with Bulky Side Chains*. Polymers with bulky side chains are interesting because they shed light on the influence of the side chain on such properties as conformational thermal and thermodynamic behavior. Different types of dielectric and viscoelastic relaxation behavior have been detected in polymers of methacrylates and itaconates.

J. M. J. Fréchet, Ithaca, NY, USA, *Synthesis of Highly Branched Polymers with Enhanced Properties*. Dendrimers and hyperbranched polymers are three dimensional globular macromolecules that have sparked a great deal of interest due to their unusual macromolecular architecture. Many unusual properties are based on their shape, numerous chain-ends and lack of entanglements. Hyperbranched polymers are more easily obtained through one-step processes such as the polycondensation of AB₂ monomers.

M. Kamachi, Toyonaka, Osaka, Japan, *ESR Study on Radical Polymerization of Vinyl and Diene Compounds*. ESR studies in radical polymerizations are the key elements to understand the propagating radicals for vinyl and diene polymerization. The structure of the propagating radicals and the propagation modes were discussed.

R. M. Hodge, Melbourne, Vic., Australia, *Free Volume and Mechanical Behavior of Poly(vinyl alcohol)*. Poly(vinyl alcohol) is a hydrophilic polymer which is of interest because of its wide possibility of applications. The effect of free volume and chain mobility on the tensile modulus and orientation achievable during drawing as well as the effect of tensile strain on the free volume and molecular mobility were discussed.

G. Moad, Clayton, Vic, Australia, *Narrow Polydispersity Block Copolymers by Free-Radical Polymerization in the Presence of Macromonomers*. A new method of producing polymers of controlled molecular weight and narrow polydispersity was described. It can be used to prepare high purity block copolymers and is based on free radical polymerization in the presence of macromonomers which react by an addition-fragmentation mechanism.

D. W. Zhu, St. Paul, MN, USA, *Perfluorocarbon Fluids: Universal Suspension Polymerization Media*. Perfluorocarbon alkanes and low molecular weight perfluoro polyethers of boiling points 50 to 200°C—which are not miscible with water or hydrocarbons are universal media for suspension polymerization. This method is particularly useful for the polymerization of reactive monomers having isocyanate, trimethylsiloxane, carboxylic acid and acid chloride functions.



Haruma Kawaguchi

Jane C. Vogl

H. Kawaguchi, Yokohama, Japan, *Functional Hydrogel Microspheres*. Monodisperse reactive hydrogel microspheres were prepared by precipitation polymerization of acrylamide, methacrylic acid and reactive group-carrying monomers. These amphiphilic polymers provide stabilizers that are formed in-situ.

T. Shimidzu, Kyoto, Japan, *Ultimate Functional Polymer Materials: Conjugating Polymer Superlattice and Porphyrin Array Connected with Molecular Wire*. Artificial conjugating polymer superlattice and porphyrin arrays connected with molecular wire have been prepared.

M. F. Rubner, Cambridge, MA, USA, *Layer-by-Layer Self-Assembly of Thin Film Heterostructures of Light Emitting*

Polymers. A new layer-by-layer molecular assembly process has been utilized to fabricate multilayer thin film heterostructure-conjugated polymers. Thin film light emitting devices have been fabricated based on poly(*para*-phenylene vinylene) and various non-conjugate polyanions.

S. A. Jenekhe, Rochester, NY, USA, *Nanostructure Polymer Systems for Optoelectronics and Photonics*. Electronic optoelectronic and photonic properties of nanostructure materials with improved structural properties are expected to have novel behavior. The synthesis of polymers was directed toward: i.) self-assembly of rod-coil copolymers into nanophase separated polymer systems and ii.) protein-like folding of rod-coil copolymers into nanostructures.

J. F. Rabek, Stockholm, Sweden, *Photoinitiated Degradation of Polymers by Metal Chlorides*. Inorganic salts are well known photoinitiators of oxidative degradation of polymers. Photoinitiation of water soluble polymers catalyzed by copper and iron oxides, especially poly(ethylene oxide) provide very interesting and useful systems for oxidative degradation using UV or visible radiation.

J. S. Riffle, Blacksburg, VA, USA, *Nitrile Function Polysiloxane Materials for High Performance Adhesives and Sealants*. Adhesives and sealants for high speed aircrafts, and fuel tanks must resist jet fuel absorption, must be thermooxidatively stable at elevated temperatures and maintain elastomeric properties over wide temperature ranges. Nitrile function polysiloxanes are excellent candidates for such applications.

A. L. Logathetis, Wilmington, DE, USA, *Perfluoroelastomers: Selection of Crosslinking Chemistry Enhance Physical Properties*. Perfluoroelastomers with oxygen, carbon, fluorine and oxygen atoms are amorphous. They are excellent high performance rubbers, when crosslinked with electronophilic species, such as aromatic or aliphatic diamines bisphenols, by trimerization of nitrile groups, present in perfluoroelastomers by peroxides of bromo- or iodo-containing perfluoroelastomers or by high energy radiation.

D. Y. Sogah, Ithaca, NY, USA, *Design and Synthesis of Nitroxyl Radicals and their Effect on Free Radical Polymerization of Styrene*. A new nitroxide, 2,5-dimethyl-2-diphenyl-1-pyrrolidinyloxy and several analogs have been synthesized and found to mediate free radical living polymerization of styrene.

F. Wudl, Santa Barbara, CA, USA, *Creating and Annihilating Luminescence with Conjugated Polymers*. Within the area of conjugated polymers, research on electroluminescent properties has become the main thrust, superseding research on improvement of conductivity and processability. The new studied polymers are those of thiophenes, phenylene-vinylene and phenylenes. Use of fullerenes can quench effectively photoluminescence of conjugated polymers within femtoseconds leading to long-lived charge separation states which can improve significantly the device characteristics of polymer photovoltaic cells.

A. G. MacDiarmid, Philadelphia, PA, USA, *Applications of Thin Films of Conjugated Polymers in Novel LED's and Liquid Crystal "Light Valves"*. Novel, flexible, completely organic liquid crystal "light valves" have been fabricated using thin films of pyridine-vinylene based on conjugated polymers as light emitting sources or on polypyrroles or polyanilines which have been deposited on the substrate.

5th Pacific Polymer Conference, Kyongju, Korea

Otto Vogl¹ and Sung Chul Kim²

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Sung Chul Kim



Otto Vogl

The 5th Pacific Polymer Conference (PPC-5) was held in Kyongju, Korea from October 26 to October 30, 1997 with Chung Yup Kim, the President of the Pacific Polymer Federation, (PPF) functioning as the Chairman of the Conference and Sung Chul Kim, as the General Secretary. PPC-5 was organized by the Polymer Society of Korea in the Hotel Hyundai, which is located in the Pomun Resort on the Pomun Lake in Kyongju.

Kyongju, a city of about 300,000 inhabitants, is located in the south east of Korea. It was the ancient capital of the Shila

Kingdom of Korea for almost 1,000 years, from 35 A.D. to the middle of the 10th century. Today the city is called the "Museum without walls" and is filled with innumerable historical sites. New archeological discoveries are still being made frequently.

Of the many sites of interest, only a few of the most important ones should be mentioned here: Tumuli Park, Dongcho-dong, is the burial site of over 24 past emperors of the Shila Kingdom. Additional royal tombs can be found in other places of Kyongju and surroundings.

The Pulguksa Temple is one of the best known temples in Korea; the temple was built in 535 A.D. Famous are also the Thirteen Story pagoda, the Posok-Chong pavilion, the Sogka pagoda and the very impressive Chomsongdae Observatory, built during the period of the United Shila Dynasty. Tongdosa Temple is one of the three greatest temples in Korea. It was founded during the Shila Kingdom and houses precious Buddhist reliques.

The Sokkuram Grotto, one of the finest Buddhist shrines in Asia houses the famous stone granite statue of a seated Seokamoni Buddha. A number of famous stone Buddhas are also located on Mt. Namsan.

Yangdong, the Folk Craft Village, was the town of the middle and upper classes of the Shila Dynasty and includes wooden houses, shrines and temples. Many kinds of craft work shops may be seen, including traditional pottery and other traditional Korean handicrafts.



Pacific Polymer Federation



Chung Yup Kim

Otto Vogl



Hotel Hyundai

PPC-5 at the Hotel Hyundai was a very large meeting, attended by about 900 participants from 20 countries; 557 papers were presented. The conference consisted of 5 plenary lectures, 77 invited papers and 160 oral presentations. 315 papers were presented in poster form.

Invitations for invited papers represented a balance of the various areas of polymer science and technology, but invited speakers were also selected to represent the geographic location of the participating organizations of the Pacific Polymer Federation.

The oral presentations, both invited papers and contributed papers, as well as the posters, were arranged in 6 scientific sessions: 1.) Polymer: Synthesis and Reactions: Novel Synthesis and Reactions, Polymerization Catalysis; 2.) Polymer Blends and High Performance Polymers: Polymer Blends, Polymer Composites, Liquid Crystalline Polymers. 3.) Functional Polymers: Membranes, Polymers for Electronics/Photonics; 4.) Biorelated Polymers: Biodegradable Polymers, Biomedical Polymers; 5.) Physical Polymer Science: Polymer Solutions & Gels, Polymer Surface & Interfaces, Structure-Property Relationships of Polymers; 6.) Modifications of Commercial Polymers.

The first three plenary lectures were part of the opening ceremony.

PPC-5 was opened on Monday morning, October 27 by the President of the Pacific Polymer Federation (PPF), Professor Chung Yup Kim of KIST in Seoul, Korea. He pointed out that the PPF has come a long way since its foundation 10 years ago, and the polymer scientists of Korea are happy and proud to have been selected to have the presidency of the PPF, to lead the organization into the second decade of its existence and to host PPC-5. The conferences of the PPF have doubled in size and attendance since the first PPC in Maui, Hawaii, in 1989.

Professor Jung-II Jin, this year's President of the Polymer Society of Korea welcomed the participants of PPC-5 to the ancient capital of Korea and wished them a scientific and socially successful meeting in Kyongju.

Congratulatory messages were also presented by U. Y. Kim, the Chairman of the Presidential Council on Science and Technology of Korea, and by Professor Akihiko Abe, a former President of the Society of Polymer Science, Japan (SPSJ) and the Senior Councilor of the PPF, representing the SPSJ.



PPC Opening



Fosong Wang, Vice President PPF

The scientific sessions were opened with the first plenary lecture by **Otto Vogl** of the University of Massachusetts, Amherst, MA 01003, U.S.A entitled *Polymers for the 21st Century*.

He stated that few scientific endeavors have had a greater impact on mankind than those in polymer science and technology. In the 21st century, polymers will be even more in demand for the numerous societal needs. From the high volume commodity plastics to the highly sophisticated specialty plastics, needs and application possibilities await the polymers of the future. Growth expectation in commodity polymer and coatings applications are higher in the less developed societies, while high value materials will develop more rapidly in industrialized economies.

Plastics use and application play an important part in the economics and comprise, in the U.S.A., about 4% of the gross domestic product. Future developments will have to pay particular attention to sound business practices and environmental conditions; waste during production and energy consumption must be kept to a minimum. Catalysis for monomer synthesis and polymerization must play an essential role as should post reactions on polymers and polymer blending, composites and macromolecular self assembly. Simple technologies to achieve controlled molecular weights and molecular weight distribution will become common practice. Uniform polymers are now being isolated and characterized similarly in uniformity of molecular weight to proteins. Precision polymers through macromolecular engineering will soon be readily available.

Takeo Saegusa of the Kansai Research Institute, Kyoto, Japan presented the second plenary lecture entitled: *Organic Polymer Metal Oxide Hybrids-Preparative Method, Structural Characteristics and Application*.

Blending of various combinations between organic polymers and inorganic materials has been useful for the exploration of novel materials possessing unique properties and characteristics. The word "hybrids" differentiates these materials which are transparent and mixtures of a macromolecular level from conventional blends and composites which are heterogeneous. Hybrid materials are prepared by a sol-gel process of the metal alkoxides in the presence of an organic polymer.

The interaction between the polymer molecule and the metal hydroxyl group plays an important role in preventing phase separation and the type and structure of the polymer is critical. The organic polymer should have functional groups which interact with the acidic hydrogen of the metal-hydroxide of the inorganic moiety. Typical metal alkoxides are derivatives of aluminum, silicon, titanium and their mixtures. The organic polymers have common electron acceptor groups, amido groups as in the polymers of 2-methyl-2-oxazoline, N-vinyl pyrrolidone and N,N-dimethylacrylamide.

The morning session was closed with the third plenary lecture by **Jung-II Jin**, President of the Polymer Society of Korea, of Seoul, Korea: *Luminescence of Poly(p-phenylenevinylidene) carrying Anthracene Pendants- Importance of Intramolecular Excited State Energy Transfer*.

Since the exciting discovery of the luminescence properties of poly(p-phenylenevinylidene) (PPV), the importance of polyconjugated organic polymers in light-emitting diode applications has been recognized. The newest addition to this development is the synthesis of PPV derivatives that have



On the Lake

anthracene moieties attached directly or through polymethylene spacers to the main chain. These polymers reveal interesting photo- and electroluminescence properties, which strongly depend on the spacer length.

The Tuesday morning session was opened with a plenary lecture by **Koichi Hatada** of Osaka, Japan: *Frontiers in Structure Control of Synthetic Polymers-from Living Polymer to Uniform Polymer*.

Structure control of polymer molecules is a primary step toward precise control of polymer properties that is required for advanced polymeric materials. Living polymerization is one of the most promising ways to control molecular weight and its distribution, but it can only be done in limited cases. Stereospecific polymerization was based on the original concept for the preparation of polypropylene. Hatada emphasized specifically that these polymerizations were stereospecific living polymerization.

Stereospecific polymerization was advanced in the polymerization of poly(methacrylates) and polymers of highly isotactic, syndiotactic and heterotactic polymers were prepared. Stereoregular random and block copolymers and macromonomers were also synthesized. Stereoregular macromonomers allowed the preparation of star, graft, and comb polymers with high stereoregularity.

Combining stereospecific living polymerization and highly efficient separation techniques of supercritical fluid chromatography has achieved the ultimate in polymer science, the preparation and identification of uniform polymers of poly(methyl methacrylate). Poly(methyl methacrylate)s of degrees of polymerization of 100 have now become available in his laboratory in measurable amounts. They were characterized and their unusual properties and behavior were investigated.

On Wednesday morning **Xiabin Jing** of the Institute of Applied Chemistry of the Chinese Academy of Sciences in Changchun, China presented his plenary lecture entitled: *Some Aspects of the Synthesis, Structure and Applications of Polyaniline*.

Conference Report



Buddha

Polyaniline is one of the intrinsically conducting polymers and is arousing wide interest in the world because of its potential as one of the best candidates to fulfill the commercial application needs of conducting polymers. In this work a synthesis of dedoped polyaniline was developed that allows its facile low-cost production on a kilogram scale. The application as cathode material for lithium batteries, for corrosion protection and its use in anti-fouling coatings for ships was evaluated.

For the preparation of polyaniline, aniline is commonly polymerized by oxidation with ammonium persulfate which is highly exothermic and difficult to control on a larger scale. It has now been found that the polymerization can be readily achieved with hydrogen peroxide with a ferrous catalyst. These polyaniline derivatives were found to be good electrocatalysts, good candidates for cathode materials and very useful for corrosion protection.

The following invited lectures were presented:

Session 1: Polymer Synthesis and Reactions:

A. Harada and M. Kamachi of Osaka University, Toyonaka, Osaka, Japan: *Preparation of polyrotaxanes from cyclodextrins and polymers.*

C. Kim of Inha University, Incheon, Korea: *Hyperbranched polymers derived from triazine molecules.*

J. Y. Chang of Ajou University, Suwon, Korea: *Preparation of the polymers with columnar structures by Intra-stack polymerization of disc-like diacetylenes.*

S. Fomine of National Autonomy University of Mexico, Coyoacan, Mexico: *Synthesis of coumarin-containing polymers and their properties.*

M. Hasegawa of Toei University, Yokohama, Japan: *Specific topics on topochemical photopolymerization mechanism and polymer properties thus obtained.*

K. Ono of Idemitsu Kosan Co., Tokyo, Japan: *Basic research on syndiotactic ZAREC.*

S. J. Wang of Industrial Technological Research Institute, Hsinchu, Taiwan: *Novel metallocene technology developed in Taiwan.*

A. Akimoto of the Tosoh Corp., Yokkaichi, Japan: *New metallocene catalyst for polyethylene and ethylene copolymers.*

J. R. Park of Yukong Ltd, Taejeon, Korea: *Synthesis of highly rigid cyclic olefin copolymers with metallocene catalysts.*

S. C. Ng of the National University of Singapore, Kent Ridge, Singapore: *Novel methodologies of self-doped polyanilines.*

E. Ueda of the Asahi Chemicals Inc. Co., Sodegaura-shi Japan: *Mechanistic study of the oxidative coupling polymerization of 2,6-dimethylphenol.*

T. Kitayama of Osaka University, Toyonaka, Osaka, Japan: *Anionic Polymerization of Methacrylate with Aluminum phenoxide Group.*

S. Nakahama of the Tokyo Institute of Technology, Ookayama, Tokyo, Japan: *Anionic Living Polymerization of 2-Haloethyl Methacrylates.*

D. Hong of the Technology Development Center SINOPEC Beijing, P.R. China: *The recent progress on the polymerization technology in SINOPEC.*

L. M. Leung of Hong Kong Baptist University, Hong Kong: *Anionic synthesis and characterization of poly(phenyl vinyl sulfoxide) copolymers.*

Y. Kawakami of Japan Advanced Institute of Science and Technology, Ishikawa, Japan: *Precision synthesis of silicon containing copolymers.*

E. Rizzardo of CSIRO Molecular Science, Clayton South Australia: *Controlled free radical polymerization.*

P. Prasassarakich of Chulalongkorn University, Bangkok Thailand: *Preparation of natural rubber-g-methyl methacrylate poly(vinyl chloride) blends.*

T. P. Davis in the University of New South Wales, Sydney Australia: *Copolymerization propagation kinetics.*

X. Jin of the Institute of Chemistry of the Chinese Academy of Sciences, P.R. China: *Synthesis and characterization of pauc-chain polymer nanoparticles.*

Session 2: Polymer Blends and High Performance Polymers

K. Nakamae of Kobe University, Nada, Kobe, Japan: *Modulus of high performance polymers and molecular conformation.*

T. E. Long of the Eastman Chemical Co., Kingsport, TN U.S.A.: *Thermotropic liquid crystalline polymers: past challenges and future opportunities.*

K. Sanui of Sophia University, Chiyoda-ku, Tokyo, Japan: *Synthesis of high performance composites by in-situ polymerization and their mechanical properties.*

A. C. Su of the National Sun-Yat Sen University, Kaohsiung Taiwan: *Formation of rigid polyisocyanate networks.*

M. K. Ahn of Indiana State University, Terre Haute, IN U.S.A.: *EPR studies of two stable free radicals in polyimide resins and their influence on the thermo-oxidative stability.*

A. Z. Abidin of the Institute of Technology Bandung Bandung, Indonesia: *A novel epoxy for high speed pultrusion.*

C. R. Choe of the Korean Institute of Technology, Seoul Korea: *New approaches for the study of toughening mechanism of rubber modified epoxies.*

C. E. Park of Pohang University of Science and Technology, Pohang, Korea: *Effects of morphology on toughening of cyanate ester resins/polysulfone blends.*

T. I. Pudiyanto of the Petrochemical and Plastics Institution Jakarta, Indonesia: *Current status of polymer blend development in Indonesia.*

D. Radic of the Pontificia Universidad Católica de Chile, Santiago, Chile: *Specific effects in polymer compatibility.*

C. S. Wang of the National Cheng Kung University, Taiwan: *Synthesis of novel trifunctional epoxy resins and their modification with polydimethylsiloxane for electric application.*

W. Chetanachan of the Thai Plastic & Chemical Public Co., Samutprakan, Thailand: *The effect of composition and mixed type on mechanical and rheological properties and morphology of PVC/NBR blend.*

G. Kojima of the Asahi Glass Co. Ltd., Yokohama, Japan: *Recent Development of Fluoroelastomers.*

K. H. Hsieh of the National Taiwan University, Taiwan: *Damping properties of polyurethane-modified epoxy/polyurethane interpenetrating polymer networks.*

Session 3: Functional Polymers Membranes, Polymers for Electronics/Photonics

K. Soma of Teijin Ltd., Tokyo, Japan: *Functional polymers and their applications - A strategy for polymer R & D.*

R. D. Miller of the IBM Almaden Research Center, San Jose, CA, U.S.A.: *Interlayer dielectrics for electronic devices: Past, present and future.*

O. K. Kim of the Naval Research Laboratories, Washington, DC, U.S.A.: *A novel supramolecular device programmed for self-assembly and self-poling.*

K. W. Lee of the IBM Watson Research Center, Yorktown Heights, NY, U.S.A.: *Surfaces and interfaces of liquid crystal alignment layer polyimides.*

Y. D. Lee of the National Tsing-Hua University, Hsin-Chu, Taiwan: *Synthesis and characterization of novel thermotropic liquid crystalline copoly(ester imide)s.*

F. M. Li of Peking University, Beijing, P.R. China: *Synthesis and photochemical properties of chromophore-containing vinyl monomers and their polymers.*

S. Minami of the Mitsubishi Rayon Co. Ltd., Kawasaki-shi, Japan: *Plastic optical fibers.*

K. J. Wynne of the Office of Naval Research, Arlington, VA, U.S.A.: *Processing assisted of nonlinear optical polymers using the accordion architecture.*

T. Ogawa of the Universidad Nacional Autónoma de México, México: *Novel host-guest systems for NLO applications.*

Y. Ikeda of the Kyoto Institute of Technology, Matsugasaki, Kyoto, Japan: *Polymer electrolytes from poly(oxyethylene)-derivatives.*

D. L. Officer of Massey University, Palmerston North, New Zealand: *A revolution in porphyrin array construction.*

H. S. O. Chan of the National University of Singapore, Kent Ridge, Singapore: *Development of quartz crystal microbalance (QCM) sensors coated with functional polymers.*

L. A. P. Kane-Maguire of the University of Wollongong, Wollongong, Australia: *Circular dichroism - A sensitive probe of conformational change in chiral polyanilines.*

G. G. Wallace of the University of Wollongong, Wollongong, Australia: *Electrochemical formation of chiral polyaniline colloids.*

H. Lee of Sogang University, Shinsoo-Dong, Seoul, Korea: *Physical properties and synthesis of poly(aniline-co-ethoxyaniline).*



On Pomun Lake Resort: Pagoda Nearby



On Pomun Resort

Conference Report

Session 4: Biorelated Polymers, Biodegradable Polymers and Biomedical Polymers

G. E. Wnek of Virginia Commonwealth University, Richmond, VA, U.S.A.: *Novel applications of block polymer hydrogels.*

Y. H. Bae of Kwangju Institute of Science and Technology, Kwangju, Korea: *Novel thermosensitive hydrogel elastomers.*

Y. Osada of Hokkaido University, Sapporo, Japan: *Intelligent gels.*

R. Y. M. Huang of the University of Waterloo, Waterloo, Ontario, Canada: *Pervaporation dehydration of isopropanol-water systems using chitosan membranes.*

F. A. Rasoul of Chiron Technol Pty Ltd., Clayton South, Vic. Australia: *Application of polymeric materials in drug discovery research.*

W. J. Cho of Pusan National University, Pusan, Korea: *Synthesis and antitumor and anti-AIDS activities of polymers containing polyanion and nucleic acid moieties.*

R. M. Ottenbrite of Virginia Commonwealth University, Richmond, VA, U.S.A.: *Interactions of synthetic oligopeptides with insulin.*

J. P. Santerre of the University of Toronto, Toronto, Ontario, Canada: *Biological processes of polymer degradation in medical implants and its inhibition with surface modifying macromolecules.*

S. S. Im of Hanyang University, Seoul, Korea: *Effect of molecular orientation on the biodegradability of aliphatic polyesters.*

Y. Okahata of the Tokyo Institute of Technology, Nakatsuda, Yokohama, Japan: *DNA strands aligned in a film.*

Session 5: Physical Polymer Science, Polymer Solutions & Gels, Polymer Surface & Interfaces, Structure-Properties of Polymers

C. S. P. Sung of the University of Connecticut, Storrs, CT, U.S.A.: *UV, fluorescence and near IR spectroscopic characterization of polymers and composites.*

I. Ando of the Tokyo Institute of Technology, Ookayama, Midori-ku, Japan: *Structure and dynamic of hydro-polymer gel systems as viewed by NMR spectroscopy.*

S. K. Kumar of the Pennsylvania State University, University Park, PA, U.S.A.: *Phase transitions of polymer mixtures.*

M. Jiang of Fudan University, Shanghai, P.R. China: *Ionomers, block ionomers: association and aggregation in aqueous and organic media.*

T. Lodge of the University of Minnesota, Minneapolis, MN, U.S.A.: *Structure and dynamics of concentrated block copolymer solutions.*

W. G. Kim of the Sam Yang Research Center, Yusung-gu, Taejeon, Korea: *Solution rheology of branched polycarbonate.*

L. Gargallo of the Pontifica University Catolica de Chile, Santiago, Chile: *Study on solution behavior of copolymers of alkyl methacrylates and monoalkylitaconates with maleic anhydride.*

M. Yamamoto of Kyoto University, Kyoto, Japan, Japan: *Local chain dynamics of polymers in ordered systems studied by the fluorescence depolarization method.*

Session 6: Modifications of Commercial Polymers

D. R. Gagnon of 3M Canada Co., London, Ontario, Canada: *"3M microporous materials": formation, surface modifications and applications.*

C. C. Ho of the University of Malaya, Kuala Lumpur, Malaysia: *Chemical modification of natural rubber latex and its effects on film formation.*

Y. Takeuchi of the Japan Synthetic Rubber Co., Chuo-ku, Tokyo, Japan: *Progress and future of liquid crystalline alignment materials and technologies.*

T. Saito of Toray Und Inc., Iyogun, Ehime, Japan: *Pursuit of technological limits - carbon fibers & composite materials.*

C. H. Choi of Samsung Chemical Group R & D Center, Taejeon, Korea: *Effects of MWD and LCB on the melt stability of HDPE.*

H. Park of Cheil Ind. Inc., Euiwang-shi, Kyongki-Do, Korea: *Recent development of flame retardant styrenic resins.*

B. K. Song of Daelim Ind. Co. Daeduk R & D Center, Taejeon, Korea: *The properties and applications of K-Resin.*

C. Heitner of the Pulp & Paper Research Institute of Canada, Pointe Claire, Quebec, Canada: *Oxidative degradation of lignin: aspects of stabilization of the color of lignin-containing paper.*

J. N. Yoo of LG Chem Ltd., Taejeon, Korea: *Control of molded surface gloss in ABS polymers.*

M. Xi of the Institute of Chemistry, Chinese Academy of Science, Beijing, P. R. China: *Polypropylene microporous films prepared by biaxial stretching techniques.*

PPC-5 began on Sunday, October 25 with the registration and an elaborate Welcoming Reception in the evening in the Conference Hall of the Hotel Hyundai. It was nice to see many old friends from earlier meetings and to make new acquaintances.

On Monday, October 26, the opening ceremony and the first three Plenary Lectures were presented for the benefit of all conference attendees and guests. For the remaining presentations



**At the Council Dinner:
Takeo Saegusa and Chung Yup Kim**



Joseph C. Salamone and Supawan Tanyanon

of the meeting, six sessions were held in smaller lecture rooms with a special lunch provided for the Plenary Lecturers, key members of the organizers and senior members of the Council of the PPF.

In the late afternoon the Council meeting of the PPF was held and included former presidents and selected observers. In the Council meeting it was pointed out that the PPC-5 was a great success with high attendance. Additional activities of the PPF were discussed, particularly the succession of the presidency. By the end of 1997 the presidency of Chung Yup Kim of Korea will come to an end and the New President will be Fosong Wang, Vice President of the Chinese Academy of Science in Beijing China. A long discussion was held to guarantee that the meeting scheduled for 1999 in Guangzhou would be a success. The meeting will be handled by the South China University in Guangzhou, China. We met the President of the University, who had received his Ph.D. at Osaka University. Ming Jiang of Fudan University, the other Councilor of China in the PPF, will also play a significant role in the organization of the meeting.

It was decided to accept the proposal of Professor Ogawa to hold the next PPC in 2001 in Mexico. Ogawa proposed to hold PPC-7 in Oaxaca, Mexico, an ancient City with a great tradition. Ogawa will become the Vice President of PPF in 1998. PPC-7 will have to be confirmed in Guangzhou. The next council meeting of the PPF will be held during the IUPAC meeting at the Gold Coast in Australia in 1998. Following the Council meeting there was an excellent dinner in the Korean restaurant at the Hotel Hyundai.

On Tuesday evening the Korean style banquet was held in the Conference Hall. Over 500 participants of the meeting attended. President Chung Yup Kim again summarized the accomplishments for the meeting and pointed out how important PPC-6 was for the further development of polymer science and technology in Korea. The banquet also allowed those present, to hear more about the upcoming PPC-6 and even PPC-7.

By coincidence the first two Presidents of the PPF, Otto Vogl and Takeo Saegusa, became 70 years old within a week of PPC-5. The Korean hosts took this opportunity to congratulate



Korean Dance



Birthday Cake: Takeo Saegusa and Otto Vogl

them at the banquet for their birthdays and presented them with a big birthday cake and a gift of Korean porcellan, they thanked them for their pioneering efforts to bring the polymer scientists of the Pacific Basin together and for their foresight in creating the Pacific Polymer Federation 10 years ago.

The 5th Pacific Polymer Conference closed on Thursday morning. Many participants felt this was an exceptional meeting as it brought not only scientists from the Pacific Basin together, but it showed that the PPF is now a fully established and healthy organization. The selection of Kyongju for the location of PPC-5 provided not only an exceptional and unusual meeting place with tradition, full of historical places and artifacts, but Kyongju and the Hotel Hyundai provided also the background for a socially most congenial atmosphere.

Sixth Pacific Polymer Conference, PPC-6 Guangzhou, China

Otto Vogl (a) and Xu Mao (b)*

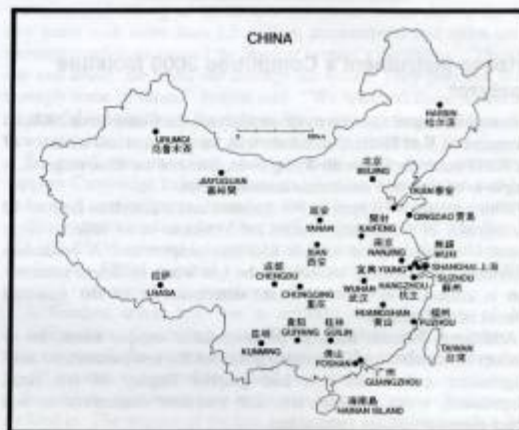
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(b) Institute of Chemistry, Chinese Academy of Sciences, Beijing 100080, China



The Sixth Pacific Polymer Conference (PPC-6) was held at the Garden Hotel in Guangzhou, China, from December 7 to December 11, 1999. Professor Wang Fosong, the President of the Pacific Polymer Federation, (PPF) functioned as the Chairman of the Conference with Liu Hanbin and Xu Mao as the Vice Chairmen; Jin Xigao was the General Secretary. The Polymer Division of the Chinese Chemical Society organized PPC-6 with the assistance of the South China University of Technology which is located in Guangzhou. The organization also relied on the advice and help of an Advisory Committee, an Organizing Committee, a Program Committee and a Local Committee.

Guangzhou is a City of almost 7 million people. It was formerly known as Canton, (the name Guangzhou, means "Wide Mouth" in English) and is the capital of Guangdong province. Guangdong is one of the 23 Provinces of China (which also has 5 autonomous regions and 4 municipalities) with a population of about 70 million people and an area of 186,000 sq. km. It is located in the south east of China, bordering the South China Sea and has a subtropical to tropical climate. Neighboring provinces are Fujian, Jiangxi, Hunan and Guangxi. Guangzhou has a distinct and unique dialect (Cantonese) and cuisine (Cantonese) and is fairly remote from traditional centers of authority.



Guangdong is now one of the most prosperous and affluent provinces in China which now includes the Special Economic Zone of Shenzhen. Guangdong's proximity to Hong Kong has made it a major gateway to Southern China. The high level of integration between the Guangdong province and Hong Kong has led to enormous economic growth, and Guangdong is sometimes considered, in spite of the special status of Hong Kong, as part of greater Hong Kong.

Guangzhou is located at the beginning of the Delta of the Xijiang (Pearl River), one of the big rivers in China; others are the Huanghe (Yellow River), and Changjiang (Yangtze). Ocean going vessels can reach Guangzhou. Hong Kong is only 2-3 hours by bus from the major Hotels of Guangzhou.

* In Chinese, the family name is written first followed by the first or given name as in **Xu Mao**. It is becoming increasingly popular among Chinese scientists to write names in the English way, **Mao Xu**, to avoid the mistakes with the family name. However in this article we are using the traditional sequence of the Chinese names. In fact, we used also this sequence for authors, other than with Chinese names, as it is done in several Journals for references.

Historically, Guangzhou was an important trading port for 2000 years throughout the Qian, Qin, Han, Tang and Song dynasties. It had an ideal geographic location. The first town to be established on the site of present-day Guangzhou dates back to the Qin dynasty, the 2nd century B. C. The first foreigners to come here were Indians and Romans as early as the 2nd century A. D. By the Tang dynasty of China, 500 years later Arab traders visited regularly.

The Portuguese arrived in the area in the middle of the 16th century and the British established trade relationships in the late 17th century and were assigned and restricted to Shamian island on the Pearl River where they had their factories. This island was and is still the center of Western influence in Guangzhou.

Guangzhou had further influence in the development of China as it was a stronghold of the republican forces after the fall of the Qin dynasty in 1911. Sun Yatsen, the first President of the Republic of China was born near Guangzhou and a monument in his honor is still a major attraction of visitation in the city.

The most important monument in Guangzhou is the Temple of the Six Banyan Trees. Significant is the 55 m pagoda, constructed in the 11th century, the tallest in the city even though the temple itself dates back to the 6th century. Inside the Guanyin temple there is a beautiful golden statue of Guanyin, the goddess of compassion.

The Bright Filial Piety Temple is one of the oldest Temples of Guangzhou, from the 4th century.



Six Banyan Pagoda



Sculpture of the Five Rams

The Five Genies Temples is the site of the appearance of the five rams and celestial beings. The sculpture of the five rams is of very recent origin but is the symbol of Guangzhou. Important to see is also the Zhenhai Tower and several Parks.

PPC-6 was attended by nearly 600 participants (130 of them were students) from 25 countries or regions; a number of participants came from Europe. The conference consisted of six plenary lectures and 85 invited papers. A total of 550 papers were presented; 200 in oral form, the rest as poster presentations.



The Guangdong Museum of Folk Handicraft

Conference Report



The Garden Hotel, Guangzhou

The invited papers provided a balance of polymer science and technology, but speakers were also selected to represent the participating organizations of the Pacific Polymer Federation.

PPC-6 began on Tuesday evening with registration and a nice Welcoming Reception in the Conference Hall of the Garden Hotel. It was nice to see many old friends and to make new acquaintances.

On Wednesday, December 8, 1999, the opening ceremony and the first two Plenary Lectures were held. Friday morning was also reserved for four Plenary Lectures. For the remaining presentations of PPC-6, six sessions were held in smaller lecture rooms.

The **Opening Ceremony** of PPC-6 started on Wednesday morning. (December 8) with a short talk by Professor Liu Huanbin, Vice Chairman of the Organizing Committee PPC-6 and President of South China University of Technology, who welcomed the participants of PPC-6.

The Opening Remarks were given by Professor Wang Fosong, President of the Pacific Polymer Federation, Chairman of the Organizing Committee of PPC-6 and a Member of the Standing

Committee, National People's Congress. He pointed out that it has come a long way since its inception 15 years ago and PPC years ago. Polymer scientists of China are happy to have been selected to have the presidency of the PPF, to lead the organization in the next millennium and to host PPC-6 in Guangzhou. The conference of the PPF have increased in importance and attendance since the PPC in Maui, Hawaii, in 1989.

Zhu Xiaodang, Vice Mayor of Guangzhou delivered a welcome address on behalf of the City of Guangzhou

Today, we are here to celebrate a magnificent event of the polymer science, the opening ceremony of the 6th Pacific Polymer Conference. It is a great honor for China, especially for Guangzhou, to host this great international event of the polymer circle for the first time on behalf of the People's Municipal Government of Guangzhou. I like to take this opportunity to extend our sincerest welcome to representatives and distinguished guests from all over the world.

In the sessions that follow, experts and scholars from around the world will meet together, to exchange and discuss ideas on fields of polymer science and technology. The conference is expected to make reviews on the achievement of polymer science and industry in the 20th century, and to envision its development in the 21st century, the 21st century. I believe that these activities will great importance to the future of polymer science.

The exploitation of new materials has become a new industry in Guangdong Province and the city of Guangzhou. It is also our focus for development for industries of advanced and innovative technology in the next century. Polymer is most popular among the new materials. In Guangzhou, polymer is widely used in businesses like electrical appliances, automobile, construction materials, product packaging and it acquires great commercial value. We sincerely hope that, doing polymer research and developing polymer science, experts and scholars may look at the city of Guangzhou, a city of science and vigor, as a market as well as a partner.

Standing at the threshold between two centuries, the ever-changing new science and technology is promising golden opportunities for the city of Guangzhou in its further development. I believe that the successful carryout of this conference can bring new ideas, information and new opportunities to the polymer development research for Guangdong Province and the city of Guangzhou. Guangdong Province and Guangzhou will contribute, with great enthusiasm, to the development of polymer science. Please allow me again, to extend my best wishes to the success of this conference and wish all the participants a very pleasant stay in Guangzhou.

At the opening ceremony, a congratulatory message was also from Lu Zhonghe, Vice-Governor, Guangdong Provincial People's Government:

Welcome to Guangdong Province! On behalf of the Guangdong Provincial People's Government, I take the pleasure to extend warmest congratulations on the opening of the 6th Pacific Polymer Conference. This conference is of great significance since it is the highest-level and most large-scale conference in polymer science in China and it takes place at a time when we are approaching the millennium.

The conference will offer a valuable opportunity for Chinese scholars and experts to exchange views with overseas academicians and for overseas experts to better understand the improvement on polymer science research in China through reviewing the achievement of polymer science and industry in the 20th century, and to explore further development in the next century. I believe that the conference



Guangdong has achieved remarkable economic growth, at the same time, the Guangdong Government is attaching great value to environment protection. We are particularly looking forward to your advice to overcome the industrial pollution problems in Guangdong Province. Meanwhile, new products and industries are expected to speed up the economic development in Guangdong Province.

It is an honor for Guangzhou to host the 6th Pacific Polymer Conference. I congratulate The Polymer Academic Committee of the Chinese Chemical Society and The South China University of Technology on their successful carry-out of this conference. I wish all the participants a most fruitful conference and a very pleasant stay in Guangzhou.

A message was also delivered by Professor Xu Zhibong, Vice President, Chinese Academy of Sciences. Messages of congratulatory greetings were also delivered by Professor Robert G. Gilbert, the Chairman of the Macromolecular Section of IUPAC and by Professor Stanislav Penczek, the Past President of the European Polymer Federation on behalf of the EPF.

The Organizing Committee of PPC-6 acknowledged the following patrons and sponsors for their contributions

Ministry of Science and Technology of China, Ministry of Education of China, The Chinese Academy of Sciences, National Natural Science Foundation of China, Provincial Government of Guangdong.

Guangzhou Municipal, China Association for Science and Technology, China Petro-Chemical Corporation, China International Culture Exchange Center, K. C. Wong Education Foundation, Hong Kong, Guangdong Science and Technology Commission, Higher Education Department of Guangdong Province.

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BASF AG, BASF (China) Co. Ltd., Beijing Yansan Petro-Chemical Corporation, SINOPEC, K. W. H. Group, Kingfa Science and Technology Development Co. Ltd., Shantou Ocean Enterprises (Group) Company, Twinson International Limited, Guangzhou Balyun Sealant Factory, the Bruke Co and the Guangzhou Chemical Industry Research Institute.

The first two plenary lectures were part of the opening ceremony.

The oral presentations both invited papers and contributed papers, as well as the posters were arranged in six scientific sessions: 1.) Syntheses and Reactions of Polymers; 2.) Structure and Properties of Polymers; 3.) Polymer Blends and Composites; 4.) Functional Polymers; 5.) Bio- and Medical Polymers and 6.) Polymer Engineering and Processing.

The **Scientific Sessions** (chaired by Wang Fosong and Akehiro Abe) were opened with the first plenary lecture by Robert G. Gilbert of the Key Center for Polymer Colloids, Sydney University, Sydney, NSW 2006, Australia entitled, "**Polymer Science and Technology in the Past and the Future: Heroism, Exploration and Enlightenment**".

The interlinked scientific and technical history of polymerization can be divided into three periods. These are illustrated for emulsion polymerization.

The first period, Heroic Age was the period in which emulsion polymers were originally produced. The technique was developed as an attempt to copy natural rubber latex. Even though the natural

process is quite different from the synthetic process of emulsion polymerization and is actually a misnomer!

The second period in emulsion polymerization was known as the Age of Exploration. The first theories of the process, a huge range of products was made, for surface coatings, adhesives and even commodity polymers. The industrial research efforts were laid down by the founders of the field. They were giants, but not omniscient, and processes were semi-empirical. Many suppositions were not correct but many excellent products were made and are currently in everyday use.

The third period of emulsion polymerization might be termed the Age of Enlightenment which is now dawning. We now are starting to understand the fundamentals of emulsion polymerizations. It is now possible to design an industrial process based on first-principles. A good example for creating novel materials is the use of controlled seeded emulsion polymerization from natural rubber latex or from polybutadiene. By controlled free-radical chemistry we can now produce (a) a comb polymer with hydrophobic backbone and hydrophilic "teeth", or (b) with sufficient *in situ* compatibilizer between two otherwise incompatible polymers and (c) to produce controlled nanostructures.

"**Stepwise Coupling Polymerization and Special Structural Polysiloxanes**" was presented by Zhang Rongben; (in cooperation with Li Cui; Liu Chunqing; Xu Hui; Xie Ping; Dai Daorong; Zhu Chuanfeng and Wang Chen) of the Center for Molecular Science, Institute of Chemistry, Chinese Academy of Sciences, Beijing 100080, China.

The synthesis of the microscopic structure of precisely defined polymer is a focus in polymer chemistry. Ladder polyphenylsilsesquioxane and the first organic cyclodextrin tubular polymer were prepared recently. We have been interested in preparing: (1) New reactive ladder polysilsesquioxanes (LPS) and organo-bridged LPS (OLPS); (2) Novel "fishbone-like" and "rowboat-like" mesomorphic LPS derived from reactive LPS; (3) tubular polysiloxanes (TP) derived from reactive and cis-isotactic LPS and (4) Sieve-plate network polysiloxanes (SNP) derived from non-cis-isotactic reactive LPS. They constitute a new family of organic-inorganic hybrid polymers with one or two-dimensional ordered network structure. The architecture of the above-mentioned polymers is accompanied with supramolecular self-assembly and templating action.

- A series of reactive LPS were successfully prepared
- TP and their supramolecular clathrates were prepared by (1+1) or (2+2) reactions from reactive and cis-isotactic LPS.
- SNP and their supramolecular or polymeric films were prepared by poling/gelling from a coupled silane.

The **early morning session** on Friday, December 10, 1999 was chaired by Otto Vogl and Qian Renyuan. It started with the Plenary Lecture **Polymers Beyond the Year of 2000**, by Ingolf Bueche, BASF A.G. Research Engineering Plastics, Ludwigshafen, Germany.

At the turn of this century, the global polymer industry is undergoing the most rapid and dramatic changes in polymer history:

- Emerging markets, particularly in Asia, and their polymer consumption are catching up with other parts of the world, creating new business opportunities.
- Economy of scale, combined with optimized logistic concepts, is becoming a key economic success factor. The optimization of plants for commodity plastics are ever increasing in size, forcing smaller suppliers out of business and creating a major hurdle for newcomers and for the introduction of new products.

Conference Report



Qian Renyuan

- c) Globalization of polymer customers and cost pressure lead to a consolidation of suppliers and products. The future trends of this development will have a significant impact on R&D activity in the polymer industry.

Molecular and Supramolecular Ordering in Confined Environments by *Stephen Z. D. Cheng*; Maurice Morton Institute and Department of Polymer Science, The University of Akron, Akron Ohio 44325-3909, U.S.A.

Molecular and supramolecular structures and phase transformation behaviors in confined environments not only have scientific interest but also possess practical industrial importance. For many years, an interesting yet difficult question has been how small can a phase be and still be called a phase? In other words, where is the lower limit of the phase size at which the macroscopic phase properties are still retained? To search for the answer, this first issue is to precisely control the phase sizes using such as strongly separated microphase, nano-size tubes and spheres and other structures. When molecules and supramolecules are confined into a one-, two- or three-dimensionally small space, the geometric sizes and chemical environments can substantially affect structure and phase (meta) stability.

A series of poly(ethylene oxide)-b-polystyrene (PEO-b-PS) diblock copolymers, where PEO blocks are crystallizable and PS blocks are amorphous were synthesized and studied, varying molecular weights of both components. The order-disorder transition temperature can be changed to control microphase structures. Three temperature parameters need to be considered to describe the phase behaviors: the order-disorder temperature, the glass transition temperature of the amorphous phase, and the crystallization temperature (always lower than the melting temperature of the PEO blocks). Generally speaking, the order-disorder temperature is under thermodynamic equilibrium while crystallization requires undercooling, and vitrification is cooling rate dependent.

The late morning session had two Plenary Lectures and was chaired by Stanislaw Penczek and He Binlin: **Molecular Design of Functional Polymers Based on Unique Properties of Polymer Chains**, by *Mikiharu Kamachi*, Department of Applied Physics and Chemistry, Fukui University of Technology, Fukui, Japan.



He Binlin

Polymer synthesis has developed remarkably in recent years and plays an important role in human life. Unique macromolecular properties can be developed by macromolecular recognition and/or self-organization of polymer chains. We have worked in three fields: a.) Radical polymerization backed by ESR spectroscopy, b.) Neopolymer synthesis, and c.) Polymer chain effect on functionalities.

α -Dextranes (CD) when threaded on a poly(ethylene glycol) (PEG) chain [but not polypropylene glycol (PPG)], form a crystalline complex in high yields, although β -CD did not form complexes with PEG. The relationship between the chain cross-sectional areas of the polymers and the diameters of the cavities of cyclodextrins is very important in the complex formation of polymers and cyclodextrins.

These findings provided a new approach to the preparation of polyrotaxanes and tubular polymers. Polyrotaxanes were prepared by end-capping of the complexes and then, tubular polymers were prepared by bridging cyclodextrins on template synthesis and removing of the end groups.

Amphiphilic polyelectrolytes from hydrophobic domains resulting from aggregation of the hydrophobic groups in aqueous solution. Photo-active function of amphiphilic polymers co-valently tethered with small amounts of a hydrophobic chromophore, was investigated in water. Photo-physical and photo-chemical behaviors of the hydrophobic chromophore were remarkably different in aqueous solutions which is ascribable to the compartmentalization of the chromophore moieties by hydrophobic domains.

Molecular Design of Light-Emitting Polymers by *Chung Ya Kim*; Korea Institute of Science and Technology, P. O. Box 137, Cheongryang, Seoul 130-650, Korea

A large number of polymer molecules with aromatic units and conjugated double bonds in the main chain have bandgaps with a range of 1.5–4.0 eV. Absorption of a photon with energy in the above range by the polymer molecules results in a light emission on a process returning to the ground state from the excited state of an electron. The color of an emitted light can be controlled by the molecular structure of polymer. The principle colors of blue, green and red have been successfully generated by various polymers. The colors are also generated electroluminescently by a light-emitting diode fabricated with a light-emitting polymer sandwiched between two electrodes.

A number of fluorene-based copolymers have been designed and synthesized for use in fabrication of polymer light-emitting diodes. Statistical copolymers have advantages for the fabrication of light-emitting diodes because of reducing the phase separation problem of polymer blend.



Takeshi Ogawa, President PPF (right)

The following *Invited Papers* were presented at PPC-6: They are here reported in alphabetic order of the authors but were actually presented in a different sequence:

Brittain, William J. (Akron, OH, U.S.A.)
Surface-initiated polymerization

Brunelle, Daniel J. (Schenectady, NY, U.S.A.)
Preparation, polymerization and processing of cyclic polyesters

Chan, Wai-Kin (Hong Kong, China)
Electronic properties of conjugated polymers with rhenium or ruthenium dipyrrophenazine complexes

Chang, Feng-Chih (Hsinchu, Taiwan, China)
Phase separation process of polycaprolactone-epoxy blend

Chen, Show-An (Hsinchu, Taiwan, China)
Thermally stable polymer ferromagnet

Chen, Yonglie (Guangzhou, China)
Study on photocuring systems containing vinyl ethers as reactive diluent

Chu, Benjamin (Stony Brook, NY, U.S.A.)
Self assembly and charge complexation of polymers

Cook, Wayne D. (Clayton, Vic., Australia)
Cure and rheology of novel IPN systems

Daly, William H. (Baton Rouge, LA, U.S.A.)
Synthesis and antibacterial properties of cellulose or chitosan quaternary ammonium derivatives

Eby, Ronald K. (Akron, OH, U.S.A.)
Aspects of the morphology of silk

George, Graeme A. (Brisbane, Qld, Australia)
New approaches to the characterization and cure optimization of thermosets for composites

Gong, Jianping (Sapporo, Japan)
Dynamic surface properties of polymer gels

Guerrero, Ramiro (Saltillo Coahuila, Mexico)
New insights on the free radical polymerization of MMA and styrene mediated by carbon centered radicals of type R-C-Ph₂

Han, Charles C. (Gaithersburg, MD, U.S.A.)
Phase separation and inter-diffusion of thin polymer blend film

Harris, Frank (Akron, OH, U.S.A.)
Polyphenylquinoxolines via aromatic nucleophilic substitution reactions

Hasegawa, Akira (Tokyo, Japan)
Recent developments in high performance polymer blends

Hattori, Iwakazu (Yokkaichi, Mie, Japan)
Molecular design of solution-(S)BR for tread of tire

He, Jiasong (Beijing, China)
In-situ hybrid composites

He, Tianbai (Changchun, China)
Soft order of polymer thin films modulated by external fields

Ho, Chee Cheong (Kuala Lumpur, Malaysia)
Adhesive force measurements of natural rubber latex film by scanning for microscopy

Hsiao, Benjamin S. (Stony Brook, NY, U.S.A.)
Toward the understanding of early stages of polymer crystallization: from quiescent state to elongational flow

Hu, Chunpu (Shanghai, China)
Interpenetrating polymer networks consisting of polyurethane

Irie, Masahiro (Fukuoka, Japan)
Photochromism of diarylethenes in confined reaction space

Jiang, Ming (Shanghai, China)
New approaches to macromolecular assembly

Jin, Xigao (Beijing, China)
Thermal curing process and degradation mechanism of high performance polyimides

Jung, Jin Chul (Pohang, Korea)
Atropisomeric polyimides

Kajiya, Tisato (Fukuoka, Japan)
Surface rheology of polymeric solids

Kakugo, Masahiro (Tokyo, Japan)
Recent progress in polyolefin materials and processing

Kiatkamjornwong, Suda (Bangkok, Thailand)
Synthesis of styrenic toner particles by SPG emulsification technique

Kim, Key Hyup (Pohang, Korea)
Newly modified polymers for differentiated synthetic fibers

Kim, Sung Chul (Taejeon, Korea)
Semi-IPN materials having morphology spectrum

Kobayashi, Shiro (Kyoto, Japan)
Precision synthesis of polysaccharides and polyesters catalyzed by hydrolase enzymes

Leung, Louis M. (Hong Kong, China)
Synthesis and characterization of poly(phenyl vinyl sulfoxide) and its copolymers

Liu, Guojun (Calgary, Alb., Canada)
Block copolymer nanofibers and thin films with nanochannels

Masuko, Toru (Yamagata, Japan)
Crystallization of biodegradable polyesters

McIntyre, Don. (Akron, OH, U.S.A.)
Polymer chain entanglement in linear and long-chain branched polymers

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Miyashita, Tokuji (*Sendai, Japan*)

Light energy conversion in organized polymer LB assemblies

Morishima, Yotaro (*Toyonaka, Osaka, Japan*)

Self-assembling amphiphilic polyelectrolytes and their nanostructures

Motoda, Takehiko (*Chiba, Japan*)

New polyolefin in foam

Ng, Siu Choon (*Kent Ridge, Singapore*)

Modification of surfaces with functional conjugated polymers

Nishi, Toshio (*Tokyo, Japan*)

Penetration of foreign polymer chains into a polymer network

Nishide, Hiroyuki (*Tokyo, Japan*)

Very high-spin organic polymers

Ogawa, Takeshi (*Mexico DF, Mexico*)

Novel diacetylenic polymers for second order nonlinear applications

Ogilby, Peter R. (*Aarhus, Denmark*)

Oxygen diffusion in glassy polymers, effects of other gases and changes in pressure

Pan, Caiyan (*Hefei, China*)

Design and synthesis of star shaped polymers

Penczek, Stanislaw (*Lodz, Poland*)

Unified mechanism of polymerization of cyclic esters

Pugh, Coleen (*Akron, OH, U.S.A.*)

Miscibility of side chain liquid crystalline polymers with different architectures

Qiu, Kunyuan (*Beijing, China*)

Vinyl radical polymerization in the presence of 2-(N,N'-diethyl-dithiocarbamyl) acetate

Quijada, Raul (*Santiago, Chile*)

Synthesis and properties of homo and copolymers coming from 1—octadecene with Zirconocene catalysts

Reneker, Darrell H. (*Akron, OH, U.S.A.*)

Polymer nanofibers, with a high ratio of surface area to mass, made by electrospinning

Rizzardo, Ezio (*Clayton South, Vic., Australia*)

Living radical polymerization by reversible addition-fragmentation chain transfer

Shanks, Robert A. (*Melbourne, Australia*)

Time, temperature, miscibility and morphology of polyolefin blends

Shen, Zhiquan (*Hangzhou, China*)

Catalytic activity of calixarene complexes of rare earth in polymer synthesis

Shi, An-Chang (*Hamilton, Ont., Canada*)

Nature of anisotropic fluctuation modes in ordered block copolymer phases

Shirai, Hirofusa (*Ueda, Japan*)

Fiber/textile containing metallophthalocyanines

Sisido, Masahiko (*Okayama, Japan*)

Peptides and proteins endowed with artificial functions

Sung, Yong Kiel (*Seoul, Korea*)

Development of biodegradable polymers for biomedical applications

Tong, Zhen (*Guangzhou, China*)

Electrostatic interaction and volume phase transition in polyelectrolyte gels

Tsujita, Yoshiharu (*Nagoya, Japan*)

Gas sorption, diffusion and permeation of ordered polymeric membranes

Tsushima, Rikio (*Tokyo, Japan*)

Production of polysaccharides by culture of plant callus, and its application to cosmetics

Ueda, Mitsuru (*Tokyo, Japan*)

Synthesis of aromatic polymers by oxidative coupling polymerization

Wang, Chun-Shan (*Tainan, Taiwan, China*)

Novel perfluoro group containing low dielectric polyimide for electronic application

Wang, Guochang (*Tianjin, China*)

Studies on aromatic ring aggregation and micromorphology of polymer system

Wang, Xianhong (*Changchun, China*)

Synthesis, structure and properties of carbon dioxide copolymer

Wang, Xiaogong (*Beijing, China*)

Study on photodynamic and photoresponsive azo polyelectrolytes

Woo, Sang Sun (*Taejeon, Korea*)

Design of high performance polypropylene, high flowability, high strength and high heat resistance

Wu, Chi (*Hong Kong, China*)

The theta-state of a single homopolymer chain in solution

Wu, Dacheng (*Chengdu, China*)

Compression-reduced polymer brushes at air-liquid interface

Wu, Wen-li (*Gaithersburg, MD, U.S.A.*)

The effects of interface and free surface on polymer thin film properties

Wynne, Kenneth J. (*Arlington, VA, U.S.A.*)

Elastomers from polydimethylsiloxane disilanol and alkoxy silanes: surface microstructures and surface characterization

Xu, Xi (*Chengdu, China*)

High performance polymers prepared through stress-induced reactions

Xue, Qi (*Nanjing, China*)

Physical properties and potential application of conductive polymers in their redox states

Yan, Deyue (*Shanghai, China*)

Kinetic model of self-condensing vinyl polymerization

Yang, Yuiang (*Shanghai, China*)

Spinodal decomposition of binary polymer mixtures—elastic and viscoelastic effects

Yu, Huisheng (*Changchun, China*)

Recent advances of cellulose and lignocellulose chemistry in China

Yu, Yaoting (*Beijing, China*)

Biomaterials in blood purification

Zhang, Xi (*Changchun, China*)

Single-molecule force spectroscopy on polymers by AFM

Zhou, Qifeng (*Beijing, China*)

Structure and properties of mesogen-jacketed liquid crystalline polymers



At the Poster Session

A special VIP luncheon, Chinese style, was provided at a special location at the Garden Hotel by the organizers for the Plenary Lecturers, members of the organizers and senior members of the Council of the PPF.

In the late afternoon, the Council meeting of the PPF was held. Several selected observers were also invited to provide the Council with the historic and legal background of PPF. In the Council meeting, it was pointed out that the PPC-6 was a success. Numerous activities of the PPF were also discussed, particularly the succession of the presidency. By the end of 1999 the presidency of Wang Fosong will come to an end and the newly elected, now Vice President Takeshi



At the Banquet



Sei-ichi Nakahama and Supawan Tantayanon

Ogawa, representing the Mexican Polymer Society, will take over as the President of PPF by January 1, 2000.

A long discussion was held to guarantee that the meeting schedule for 2001 in Oaxaca, Mexico would be a success and details were presented. It seems that two organizations in Mexico will be involved in the details of organizing PPC-7.

PPC-8 is scheduled to be arranged by the Polymer Group in Thailand with Professor Supawan Tantayanon responsible for the organization. She will become the Vice President of the PPF on January 2000. It was understood that the Chairmanship of PPF, as it was stated in the original Councilor assignment in the constitution, the position of the Councilor seat and the now elected Chair will actually be handled by the polymer organizations of the ASEAN countries. The Council was told that the organization of Malaysia (C. C. Ho) will see that this presidency and the organization of PPF-8 will be supported and co-organized by the polymer organizations of these countries.

It had become desirable that an organization of the Founding members should be willing to take the presidency and arrange for PPC-9 Professor Horie, the Councilor of Japan, indicated that SPSJ would be willing to take the Presidency after 2003 and host PPC-9 in 2005. This is a very preliminary proposal and depends on a number of commitments, which Horie said he would explore.

An elegant dinner was held after the Council meeting, confirming the close atmosphere that existed between the Council members in their effort to perfect the PPF and to bring it into the needs for the next century.

On Friday evening, a Cantonese style banquet was held in the Conference Hall. Over 500 participants of the meeting attended. President Wang Fosong summarized the accomplishments for the meeting and pointed out how important PPC-6 was for the development of polymer science and technology in China and in the region.

The after dinner speech was presented by Professor Otto Vogl, the first President of PPF. He reminisced about the first ideas of the formation of PPF organization at an ACS meeting in Hawaii in 1984. It was the brainchild of the three persons that had substantial influence in their organizations: Otto Vogl, at that time the "Foreign Minister" of the ACS Division of Polymer Chemistry, USA, Professor Takeo Saegusa, of the Society of Polymer Science, Japan and (the late) Professor James O'Donnell, of the Polymer Division of the Royal Australian Institute of Chemistry. Professor Vogl pointed out that it took almost three years of discussions to conclude the agreement and to write the constitution. Negotiations started seriously in Kyoto, at the US-Japan meeting on Polymer Chemistry, a bilateral meeting held in 1985 at the Heian Kaikan

Conference Report



Dang van Luyen and Wang Fosong

Hotel in Kyoto by the leaders of SPSJ and the ACS Division of Polymer Chemistry. Negotiations continued at the Annual Meeting of the Australian Polymer Division on the Gold Coast in Australia and in Brooklyn. The final touches on the agreement were made again in Australia, at the Annual Polymer meeting in Phillips Island in Australia. Vogl still remembers that Professor Robert Shanks, then the Chairman of the Australian Polymer Group told him, Vogl, the chief negotiator to pick up the phone, call Tokyo and tell SPSJ that we all agree, that we agree on the wording of the Constitution and we agree to establish immediately the Pacific Polymer Federation.

The constitution describing the formation of the Pacific Polymer Federation was signed on October 19, 1987 at the International House in Tokyo and Professor Otto Vogl became its first President of PPF. The first Conference of the PPF, which would now be called PPC-1, was held in Maui, Hawaii, in December 1989.

Otto Vogl recognized the dedicated devotion of a number of people that were essential for the creation of PPF: Professor Akihiro Abe, longterm Councilor of SPSJ, the signatory chairmen of the Polymer Division of the Royal Australian Institute of Chemistry, Professor David



Stanislaw Penczek, Lu Yuanfang and Mikiharu Kamachi

Hill, of the ACS Polymer Division, Professor Ronald Eby and the signatory President of SPSJ, Professor Motowo Takayanagi. As mentioned by Professor Vogl, Professor Joseph C. Salamone, the 4th President of PPF also played a major role in the creation of PPF. Soon after PPF was founded, the Korean Polymer Society joined with Professors Sung Chul Kim and Chun Yup Kim, the 5th President of PPF, as the driving forces.

Soon after the joining of the Korean Society, the then President of PPF, Professor Vogl successfully urged his friend Professor Qian Renyuan, to have the Chinese Polymer Division of the Chinese Chemical Society join PPF. By now the PPF has 17 member organizations representing about 60,000 polymer scientists of the Pacific area.

The banquet attendees also heard from Professor Takeshi Ogawa who discussed the upcoming PPC-7 in Oaxaca, Mexico and Professor Stanislaw Penczek, Chairman, of the 38th IUPAC Symposium on Macromolecules, which will be held next in July 2000 in Warsaw, Poland.

The 6th Pacific Polymer Conference closed on Saturday morning, the participants felt it was a very successful meeting which showed that the PPF is now a permanent regional organization of Polymer Science and Technology that excellently fulfills the needs of Polymer Science in the Pacific Region. The selection of Guangzhou for the location of PPC-6 provided a most exciting and congenial atmosphere and presented modern science in China at its best.



At the Banquet: (from left) Otto Vogl, Han Dajian, Wang Fosong, Robert Gilbert and Irene Penczek



Darrell Reneker and Ronald Eby

Pacific basin groups form polymer federation

A new international organization in polymer chemistry called the Pacific Polymer Federation has been formed by the Division of Polymer Chemistry of the American Chemical Society; the Society of Polymer Science, Japan; and the Polymer Division of the Royal Australian Chemical Institute.

Formed as an organization to advance and benefit polymer science and technology, the federation, according to its constitution, has a twofold purpose. One objective is "to encourage and facilitate interaction between polymer organizations involving the Pacific." The second is "to encourage and facilitate exchange of scientific knowledge, participation in national polymer meetings, and visits by polymer scientists of the Pacific."

Various types of umbrella polymer organizations have come into existence over recent years. Within ACS, the Macromolecular Secretariat was developed in 1972 as a way for various divisions in ACS with polymer interests to cooperate. Indeed, that secretariat became the model for the Computer Secretariat and Biotechnology Secretariat that

have since been formed. An Inter-society Relations Committee formed in 1974 was intended to be a bridge for groups with polymer interests within and outside ACS, but it has had limited activity.

At the international level is the Macromolecular Division of the International Union of Pure &



Vogl: first president of new federation 30 November 16, 1987 C&EN



Signing agreement are (from left) Australia's Hill and O'Donnell, Japan's Takayanagi and Abe, and U.S.'s Eby and Vogl

Applied Chemistry. It is involved, however, with only a part of the international activities in polymer chemistry: It assigns sponsorship of certain meetings, and it has a nomenclature committee. A European Polymer Federation has been in existence for a few years with functions similar to those of the IUPAC division.

The new Pacific Polymer Federation, as a regional organization, has the potential to provide for close cooperation of its partners in programs of interest. The Pacific is a fast-growing region, and polymer science is internationally a very vigorous discipline.

The agreement creating the new polymer federation was signed at

Tokyo's International House in the Roppongi area on Oct. 19. Signing were Motowo Takayanagi, president of the Society of Polymer Science, Japan; Ronald K. Eby, chairman of the ACS Division of Polymer Chemistry; and David J. T. Hill, chairman of the Polymer Division of the Royal Australian Chemical Institute. Also signing were the chairmen of the

Science

respective international relations and foreign affairs committees of the organizations, Akihiro Abe, Otto Vogl, and James H. O'Donnell.

Otto Vogl, the Herman F. Mark Professor of Polymer Science at Polytechnic University, New York City, was elected the first president of the Pacific Polymer Federation at the organizing meeting of the federation council. He is a former chairman (1974) of the ACS Division of Polymer Chemistry. Takeo Saegusa, former president of the Society of Polymer Chemistry, Japan, and currently chairman of the Macromolecular Division of IUPAC, was elected vice president, and O'Donnell, chemistry professor at the University of Queensland, Brisbane, and former president of the Royal Australian Institute of Chemists, was elected deputy vice president. Joseph C. Salamone, professor in the polymer science program of the University of Lowell in Massachusetts, became secretary/treasurer.

Membership in the federation is open to all societies and associations of the region that have at least part of their activities devoted to polymer science or technology. Indeed, Vogl says the founders expect that other polymer-oriented organizations of the Pacific region will join soon to make the federation completely representative for the region. The region is believed, he says, to have as many as 50,000 scientists involved in research, production, and fabrication of polymers and related materials.

Vogl notes that the idea for the federation arose during discussions between himself, Saegusa, and O'Donnell during the International Chemical Congress of Pacific Basin Societies, held in Honolulu in December 1984. It took two and a half years of negotiations by the committees, however—two sessions in Japan, two in the U.S., and one in Australia—before all the differences could be ironed out and a constitution agreed upon and signed.

The federation is administered by a council consisting of a maximum of 10 members, each member serving a two-year term. Each founding organization has two representatives on the council and each

nonfounding organization one. When the number of council members reaches 10, a rotation of seats among the representatives of nonfounding organizations will be established. The composition of the council is to be reconsidered after 10 years.

At the first meeting of the council following the signing of the con-

stitution, it was agreed to hold the first conference to be organized by the federation in Maui, Hawaii, in December 1989. The conference will correspond with the next International Chemical Congress of Pacific Basin Societies, which is scheduled to convene in Honolulu Dec. 17-22, 1989.

James Krieger, Washington

May 1988, THE DIVISION OF POLYMER CHEMISTRY, Newsletter

PACIFIC POLYMER FEDERATION FORMED, VOGL FIRST PRESIDENT

After two and one half years of negotiations, an agreement was signed on October 19, 1987, in Tokyo, Japan, between the President of the Society of Polymer Science, Japan, Motowo Takayanagi; the Chairman of the Division of Polymer Chemistry, American Chemical Society, Ronald K. Eby; the Chairman of the Polymer Division of the Royal Australian Chemical Institute, David J. T. Hill; and, the Chairmen of the respective International Relations and Foreign Affairs Committees, Akihiro Abe, Otto Vogl and James H. O'Donnell, to form the Pacific Polymer Federation. The Constitution describes the objective of the federation as "to encourage and facilitate interactions between polymer organizations of the Pacific and exchanges of scientific knowledge, participation at scientific meetings and visits by polymer scientists of the Pacific".

Membership in the federation is open to all societies and associations of the region which have at least part of their activities devoted to polymer science and/or technology. It is expected that other polymer oriented organizations of the Pacific region will join the Pacific Polymer Federation to make it completely representative for the region. The region is believed to have as many as 50,000 scientists involved in research, production and fabrication of polymers and related materials.

At the organizing meeting of the Council of the Federation, Otto Vogl, a former Chairman (1974) of the ACS, Division of Polymer Chemistry, Inc., was elected the first President of the Pacific Polymer Federation; Takeo Saegusa, former president of the Society of Polymer Science, Japan, and presently the Chairman of the Macromolecular Division of IUPAC, became Vice President; and, James H. O'Donnell, former President of the Royal Australian Institute of Chemists, became Deputy Vice President. Joseph C. Salamone, former chairman (1982) of the ACS, Division of Polymer Chemistry Inc., was elected Secretary/Treasurer.

At the first meeting of the Council, subsequent to the signing of the constitution, it was agreed to hold the first Conference organized by the federation in Maui in December 1989. Several Committees, staffed by the member organizations of the federation, are now being established to provide for the coordination of the member organizations of the federation.



Federation Founders: Dr. O. Vogl, Dr. T. Saegusa, and Dr. J.H. O'Donnell.

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Pacific Polymer Federation Formed, Vogl First President



Otto Vogl

An agreement was signed on October 19, 1987 in Tokyo, Japan [in the International House (Kokusai Bunka Kaikan) in Roppongi] between the President of the Society of Polymer Science, Japan, Motowo Takayanagi, the Chairman of the Division of Polymer Chemistry, American Chemical Society, Ronald K. Eby, the Chairman of the Polymer Division of the Royal Australian Chemical Institute, David J. T. Hill and the Chairmen of the respective International Relations and Foreign Affairs Committees Akihiro Abe, Otto Vogl and James H. O'Donnell to form the PACIFIC POLYMER FEDERATION. The CONSTITUTION describes the objective of the FEDERATION as "to encourage and facilitate a.) Interactions between polymer organizations of the Pacific and b.) Exchanges of scientific knowledge, participation at scientific meetings and visits by polymer scientists of the Pacific."

Membership in the FEDERATION is open to all societies and associations of the region which have at least part of their activities devoted to polymer science and/or technology. It is expected that very soon other polymer oriented organizations of the Pacific region will join the PACIFIC POLYMER FEDERATION to make it completely representative for the region. The region is believed to have as many as 50,000 scientists involved in research, production and fabrication of polymers and related materials.

At the organizing meeting of the Council of the Federation, Otto Vogl, a former Chairman (1974) of the ACS Division of Polymer Chemistry, Inc., was elected the first President of the PACIFIC POLYMER FEDERATION. Takeo Saegusa, former president of the Society of Polymer Science, Japan and presently the Chairman of the Macromolecular Division of IUPAC, became Vice President and James H. O'Donnell, former President of the Royal Australian Institute of Chemists became Deputy Vice President. Joseph C. Salamone (USA) was elected Secretary/Treasurer.

The idea for this FEDERATION came up during the meeting in Hawaii, December 1984, when Professor Vogl suggested it to Saegusa and O'Donnell. It took, however 2½ years of negotiations of the committees, twice in Japan, twice in the U.S., and once in Australia, to iron out all the differences, true and imagined, before the constitution could finally be agreed upon and signed. The first Conference organized by the FEDERATION will be in Maui, Hawaii in December 1989. Several Committees, staffed by the member organizations of the FEDERATION, are now being set up to provide the coordination of the member organizations of the FEDERATION.

SPSJ

ANNOUNCEMENT

1987-12

太平洋高分子連合 (Pacific Polymer Federation) 設立について



このたび、日米豪3ヵ国の高分子学会（または高分子分科会）が中心となって Pacific Polymer Federation (PPF) を設立することになった。その目的は、PPF の憲章にあるとおり、

- 1) 太平洋沿岸諸国に基盤を有する高分子学会間の交流を図る。
- 2) これら諸国間で高分子研究者の相互訪問、高分子研究集会への参加などの便宜を図り、科学・技術情報の交換を円滑化する。

ことにある。

太平洋圏に基盤をもつ国の国情が多様であることを考慮して、まず日本高分子学会、米国化学会（高分子分科会）、オーストラリア化学会（高分子分科会）の3学会が設立メンバーとして PPF の基礎を確立し、その上で他の国の学会に参加を呼びかける手順とした。

設立交渉の過程では、高分子物質の有用性、自然科学に内在する学問としての普遍性、太平洋の地理的重要性が3つの基本要因として論じられた。今後、IUPAC の高分子部会、最近設立されたヨーロッパ高分子連合 (EPF) などとも交流を深めていく方針である。当然のことではあるが、PPF の設立は日本の高分子学会会員により広い活動の場を提供することになり、ひいては高分子学会の役割を国際的に高めることになるはずである。

本年の高分子討論会（東京）の直前、10月19日国際文化会館に関係者が一堂に会し、PPF 設立の調印式が挙行された。それぞれの学会（分科会）を代表して、高柳、Eby、Hill の各会長、交渉に当たった担当者として、Vogl、O'Donnell 両教授と安部が Constitution に署名を行なった。PPF の正式の発足は、1988年1月1日である。

PPF 理事会 (Council) は設立メンバーである3国の学会から2名ずつ選ばれる理事をもって構成する。理事互選で会長、副会長、総務・財務担当を決める。過日、調印式後の会議で選任された第一期の理事会メンバーは、会長 Vogl 教授 (米)、副会長三枝教授 (日)、O'Donnell 教授 (豪)、総務・財務担当 Salamone 教授 (米)、理事 Hill 教授 (豪)、安部 (日) 以上6名である。

具体的な活動は憲章の精神に則って、理事会が企画、実施することになる。PPF 発足後直ちに、太平洋圏諸国の学会に参加を呼びかけていくことになるが、そのための加入申請書作りから始めねばならない。

当面の目標として、1989年12月ハワイで予定されている太平洋化学会 (CHEM. PAC) の折に、PPF の第1回コンファレンスをマウイ島で開催することが合意されている。

活動の規模は予算によって決まるが、メンバーからの会費納入制はとらないので、自助努力で、ある程度の収入を計らねばならない。世の中が必要とする事業には、それなりの資金もついてくるはずである。要は企画しだいであろう。

日本の高分子学会は、設立メンバーとして、この PPF を育てる立場にある。新しい皮袋にどんな酒が入ることになるのか、PPF 設立交渉を担当したものとして、高分子学会会員の積極的な提案、参画を切に願うするしだいである。

(文責=国際交流委員会 安部明彦)
(後書) PPF Constitution (英文) の刷り本は、高分子学会事務局へご請求下さい。

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Technology

Pacific Polymer Federation expanding

Four new members have been admitted to the Pacific Polymer Federation by the year-old group's council. They join the three groups—the Division of Polymer Chemistry of the American Chemical Society; the Society of Polymer Science, Japan; and the Polymer Division of the Royal Australian Chemical Institute—that founded the federation to encourage and facilitate interaction among polymer organizations involving the Pacific. The new members are the Polymer Society of Korea, the Macromolecular Science & Engineering Division of the Chemical Institute of Canada, and the polymer divisions of the Malaysian and New Zealand chemical societies. According to Polytechnic University professor Otto Vogl, current president of the federation, inquiries also have been received from Singapore and from the High Polymer Division of the American Physical Society. The 1st Pacific Polymer Conference is scheduled to be held in Maui Dec. 12-16, 1989, the week before the International Chemical Congress of Pacific Basin Societies in Honolulu.

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THE PACIFIC POLYMER FEDERATION

Otto Vogl, President
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333 Jay Street, Brooklyn, NY 11201, U.S.A.

The PACIFIC POLYMER FEDERATION was founded on October 19, 1987 in Tokyo, Japan. It was formed by the founding members, the Society of Polymer Science, Japan, the Division of Polymer Chemistry of the American Chemical Society, and the Polymer Division of the Royal Australian Chemical Institute.

The FEDERATION was created as an organization to advance and benefit polymer science and technology in the Pacific Basin; it has as its objectives to encourage and facilitate: i.) Interaction between polymer organizations of the Pacific Basin; and ii.) Exchange of scientific knowledge. The membership of the FEDERATION is open to all societies and associations of scientists and engineers which have at least part of their activities devoted to polymer science and/or technology.

Since the original foundation of the FEDERATION the following organizations have joined: the Macromolecular Science and Engineering Division of the Chemical Institute of Canada; The Society of Polymer Science, Korea; the Polymer and Industrial Section, Malaysian Institute of Chemistry; the Polymer Group, New Zealand Institute of Chemistry; the Polymer Division, Chinese Chemical Society; the Singapore Plastics and Rubber Institute and the American Physical Society.

The Federation is governed by a Council. The President of the FEDERATION is Otto Vogl, U.S.A., the Vice-President is Takeo Saegusa, Japan, the Deputy Vice President James H. O'Donnell, Australia and the Secretary/Treasurer Joseph C. Salamone, U.S.A.

The governing Council meets 2-3 times a year; it is assisted by several Committees which are responsible for Membership, Information, Publication, Finance, Conferences and Awards.

The FEDERATION has conducted one very successful Conference, the First Pacific Polymer Conference in Maui, Hawaii on December 12-15, 1989 and is planning the Second Pacific Polymer Conference in Shiga, Japan from November 26-29, 1991.

The Pacific Polymer Federation

The Constitution of the Pacific Polymer Federation was signed on October 19, 1987 in Tokyo, Japan at the International House in Roppongi, Tokyo by the Chairman of the Division of Polymer Chemistry, ACS, Ronald K. Eby and the Chairman of the Foreign Affairs Committee, Otto Vogl; by the President of the Society of Polymer Science, Japan, Motowo Takayanagi, and by Vice President for International Affairs, Society of Polymer Science, Japan, Akihiro Abe; by the Chairman of the Polymer Division of the Royal Australian Institute of Chemistry, David J.T. Hill, and by the Chairman of the International Committee James H. O'Donnell.

The FEDERATION was created as an organization to advance and benefit polymer science and technology in the Pacific Basin; it has as its objectives to encourage and facilitate: i.) Interaction between polymer organizations of the Pacific Basin; and ii.) Exchange of scientific knowledge, by participation in national meetings and by visits of polymer scientists of the Pacific. The membership of the FEDERATION is open to all societies and associations of scientists and engineers which have at least part of their activities devoted to polymer science and/or technology.

The duly appointed Council met in the afternoon of October 19, 1987 in Tokyo for its so-called "zero" meeting. O. Vogl was elected the first President of the FEDERATION, T. Saegusa, Vice President, J. O'Donnell, Deputy Vice President and J. Salamone Secretary/Treasurer. The President was charged to set up the FEDERATION, and particularly, to organize the First Pacific Polymer Conference in December 1989 in Maui, Hawaii.

It was very gratifying to see a regional organization involving the Polymer Scientists of the Pacific region come into being. Polymer Science is presently one of the fastest growing scientific and technological disciplines and the Pacific Basin is the fastest growing region scientifically, technologically and economically in the world today. It was only logical, that the organizations of the region found a mechanism of cooperation and also found a mechanism

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of facilitating the interaction of individual scientists. In the last year of interaction between the organizations and the Council members, representing the organizations, a great deal has been accomplished which promises that the original concept, the dream of a smoothly functioning regional cooperation in polymer science can be established.

The process of establishment of the FEDERATION began with a meeting of Saegusa, O'Donnell and Vogl at a meeting in Hawaii in December 1984; at that time the concept of a regional scientific organization was developed. It was decided to explore with the parent organizations (which became the Founding Members) to determine if it were possible to devise a Constitution which could incorporate all the interests of the polymer oriented organizations of the Pacific Basin. Much of the individual writing was done prior to and during the U.S.-Japan Seminar in October 1985, and at the Annual Meeting of the Society of Polymer Science, Japan in May 1986, at which time all parties were present. In New York, in September 1986, and at the Annual Meeting of the Polymer Division of the Australian Institute of Chemistry in February 1987 the details of the Constitution and the subsequent understandings were worked out and final agreement to establish the PACIFIC POLYMER FEDERATION was reached. All these negotiations were done before the benefits of Fax machines were available and much thought went into the preparation of the document. At the same time, the organizations and individuals involved in the negotiations had time to realize how important the development of the FEDERATION was for Polymer Science and for the interests of polymer oriented organizations and individuals of the Pacific region.

At the second meeting of the Council of the FEDERATION in Kyoto July 31, 1988, 3 applications for admission to the PACIFIC POLYMER FEDERATION had been received. The Council decided to admit all three organizations: The Macromolecular Science and Engineering Division of the Chemical Institute of Canada, the Society of Polymer Science of Korea and the Polymer and Industrial Section of the Malaysian Institute of Chemistry and invited them to provide one Councillor each for their admission date, January 1989. The second Council Meeting was held near Brisbane, Australia on February 6, 1989. Two more organizations were admitted to the FEDERATION: The Polymer Division of the Chinese Chemical Society of the People's Republic of China and the Polymer Group of the New Zealand Institute of Chemistry. We now

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have applications to join the PACIFIC POLYMER FEDERATION on hand from the American Physics Society, High Polymer Division and polymer oriented organizations from Singapore and Vietnam.

The FEDERATION has already become a healthy organization; it functions with 8 committees, has produced the first Newsletter and, I hope, will have an excellent scientific meeting here in Maui.

I am convinced that the organization will continue to grow vigorously during my term as President of the PACIFIC POLYMER FEDERATION and during the terms of my successors to an essential part of science and technology in the Pacific region.

Otto Vogl, President

Maui, Hawaii, December 12, 1989

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