

1990

First Pacific Polymer Conference

Jane C. Vogl

Gerald Kirshenbaum

Follow this and additional works at: https://scholarworks.umass.edu/emeritus_sw



Part of the [Chemical Engineering Commons](#), and the [Chemistry Commons](#)

Vogl, Jane C. and Kirshenbaum, Gerald, "First Pacific Polymer Conference" (1990). *Polymer News*. 104.
Retrieved from https://scholarworks.umass.edu/emeritus_sw/104

This Article is brought to you for free and open access by ScholarWorks@UMass Amherst. It has been accepted for inclusion in Emeritus Faculty Author Gallery by an authorized administrator of ScholarWorks@UMass Amherst. For more information, please contact scholarworks@library.umass.edu.

First Pacific Polymer Conference

Gerald Kirshenbaum

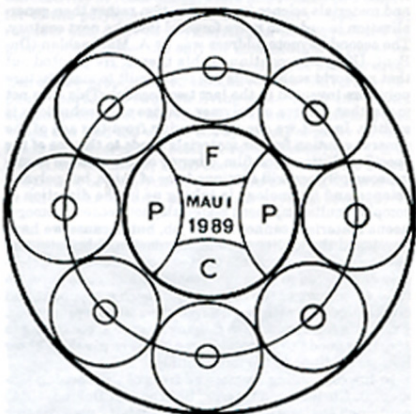
Hoechst Celanese Corporation
Engineering Plastics Division
Chatham, New Jersey

Jane C. Vogl

Pacific Polymer Federation
Polytechnic University
333 Jay Street
Brooklyn, New York 11201

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. Abo (Japan), D.J.T. Hill (Australia), R. Karim, (Malaysia), C.Y. Kim (Korea), M. Navratil (Canada) and Remyuan 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. Gaudiana, S. Israel, M. Yamabe, K. Ghiglini, 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.

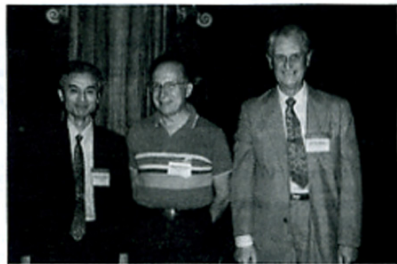
The copolymerization of olefin-terminated oligomers and polymers (macromonomers) with common monomers has become one of the most effective and versatile methods for synthesizing well-defined graft copolymers. In this procedure, the chain length of the macromonomer (graft) can be preselected and the spacing 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 multi-function, 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 polycarbonates can be used to form ordered blocks of aryl ethers and aryl carbonates. T.



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

Saga 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)-novolac 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).