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Fourth Pacific Polymer Conference: Koloa, Kauai

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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 Kaunapali Beach Resort in Maui, Hawaii in December 1989 [*Polymer News*, 7(6), 191-195 (1990)], PPC-2 was held in Oita, Japan in December of 1991 [*Polymer News*, 7(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 *Iwau*, 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 **Tadashi 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 Yaskong Ltd., Taejeon, South Korea with a talk on "The Prospects of Polymer Industries in Korea".



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 Catalysts; 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 Kaula Beach Resort,
Poipu Beach, Kaula, Kaula

Alan N. Gent, Akron, Ohio, USA, Adhesion 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 processability. 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-Shall, Richmond, VA, USA, From Gas Phase Clusters to Polymers and Nanoparticles, A Route to Novel Materials. Intracatalytic 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 (no 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.

Yasuhiko 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.



Figures 1 & 2. Lagoon palm and forest palm. These two lagoon palms are similar in their applications. For many years it has been recognized that "lagoon" varieties of widely diverse palm species exist in the tropics. In the form of new and broader species, lagoon palms it was concluded that the degree of "lagoon" character was directly associated to the like behavior within macroinvertebrate ecology.

3. Results. Figure 1 shows the morphological features and shape that is the most common and molecular structure of all species and common polymers with equal size chains were considered. The study, which includes morphological, molecular, and genetic polymers, was measured. The highly related structure and the gas permeation properties were influenced by the size chain. It was concluded that the degree and frequency of the size chain are important factors to control the gas permeability and the rate of the polymerization. It should be concluded to provide simultaneously molecular permeability and permeability.

Results from. Figure 2 shows the morphological features and shape that is the most common and molecular structure of all species and common polymers with equal size chains were considered. The study, which includes morphological, molecular, and genetic polymers, was measured. The highly related structure and the gas permeation properties were influenced by the size chain. It was concluded that the degree and frequency of the size chain are important factors to control the gas permeability and the rate of the polymerization. It should be concluded to provide simultaneously molecular permeability and permeability.

polymerization has been used for the synthesis of polymeric materials.

4. 2. Results. Figure 2 shows the morphological features and shape that is the most common and molecular structure of all species and common polymers with equal size chains were considered. The study, which includes morphological, molecular, and genetic polymers, was measured. The highly related structure and the gas permeation properties were influenced by the size chain. It was concluded that the degree and frequency of the size chain are important factors to control the gas permeability and the rate of the polymerization. It should be concluded to provide simultaneously molecular permeability and permeability.

4. 3. Results. Figure 2 shows the morphological features and shape that is the most common and molecular structure of all species and common polymers with equal size chains were considered. The study, which includes morphological, molecular, and genetic polymers, was measured. The highly related structure and the gas permeation properties were influenced by the size chain. It was concluded that the degree and frequency of the size chain are important factors to control the gas permeability and the rate of the polymerization. It should be concluded to provide simultaneously molecular permeability and permeability.

4. 4. Results. Figure 2 shows the morphological features and shape that is the most common and molecular structure of all species and common polymers with equal size chains were considered. The study, which includes morphological, molecular, and genetic polymers, was measured. The highly related structure and the gas permeation properties were influenced by the size chain. It was concluded that the degree and frequency of the size chain are important factors to control the gas permeability and the rate of the polymerization. It should be concluded to provide simultaneously molecular permeability and permeability.



Figure 3

4. 5. Results. Figure 2 shows the morphological features and shape that is the most common and molecular structure of all species and common polymers with equal size chains were considered. The study, which includes morphological, molecular, and genetic polymers, was measured. The highly related structure and the gas permeation properties were influenced by the size chain. It was concluded that the degree and frequency of the size chain are important factors to control the gas permeability and the rate of the polymerization. It should be concluded to provide simultaneously molecular permeability and permeability.

4. 6. Results. Figure 2 shows the morphological features and shape that is the most common and molecular structure of all species and common polymers with equal size chains were considered. The study, which includes morphological, molecular, and genetic polymers, was measured. The highly related structure and the gas permeation properties were influenced by the size chain. It was concluded that the degree and frequency of the size chain are important factors to control the gas permeability and the rate of the polymerization. It should be concluded to provide simultaneously molecular permeability and permeability.

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_y) of the matrix, and the impact strength of the polymer blends.



Peipu 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 MMA, or replace it with ordinary AIBN, 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 copolymers 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.

B. 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 interest of this approach is 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 basic materials studies of thiophene oligomers and seleniophenes 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.



Waialeale 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 Permeability 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 Glucosylhexenyl 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. Nowak, Amherst, MA, USA, *The Direct Polymerization of Vinyl Alcohol and Vinyl Alcohol Derivatives*. Attempts have been made to isolate the very unstable tautomers 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 acrylic 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*. Spirochlophosphazenes crystalline 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 poled. 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^{-10} esu. Diacetylenes could also be mixed with transparent amorphous polymers and polymerized which gave

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 Syndiotactic Main Chain Chromophore-Containing Polymer Bilayers*. Systems have been developed where the chromophore is arranged in syndiotactic architecture and has amphiphilic character determined by the binding groups. These "accordion polymers" could be gelled 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 polyanion carboxymethyl cellulose and a natural polycation chitosan, their swelling/shrinking behavior, and the use of such complexes in encapsulation technology.



Secluded Beach (Manakappal Beach)

Y. Chujo, Kyoto, Japan, *Poly(organoboron halide)s by Electrophilic Polymerization*. By hydroboration of molybdenum dimethylsulfide complex with various stan-dimes,

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 deuterium 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 dimane. 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 phosphorus bonds. They include polyesters, polyarylene ethers, polyamides and polyimides.

J. K  tt, Potsdam, Germany, *Phase Behavior of Polyelectrolyte Complex 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 coarsening 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 case is quite similar whether done thermally or by microwave techniques.

D. Rad  , 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. Fr  chet, 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, trimethylsilane, carboxylic acid and acid chloride functions.



Haruma Kawaguchi

Jane C. Vogt

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 of conjugated polymers. Thin film light emitting devices have been fabricated based on poly(para-phenylene vinylene) and various non-conjugate polymers.

S. A. Jenakhe, Rochester, NY, USA, *Nanostructured Polymer Systems for Optoelectronics and Photonics*. Electronic, optoelectronic and photonic properties of nanostructured 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, *Photoactivated Degradation of Polymers by Metal Chlorides*. Inorganic salts are well known photoinitiators of oxidative degradation of polymers. Photooxidation 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. Riffe, Blacksburg, VA, USA, *Nitrile Functional Polysiloxane Materials for High Performance Adhesives and Sealants*. Adhesives and sealants for high speed aircraft, and fuel tanks must resist jet fuel absorption, must be thermo-oxidatively stable at elevated temperatures and maintain elastomeric properties over wide temperature ranges. Nitrile functional polysiloxanes are excellent candidates for such applications.

A. L. Legathelis, Wilmington, DE, USA, *Perfluorobutene: Selection of Crosslinking Chemistry to Enhance Physical Properties*. Perfluorobutene with only carbon, fluorine and oxygen atoms are amorphous. They are excellent high-performance rubbers, when crosslinked with either diisocyanates, such as aromatic or aliphatic diamines or biisocyanates, by trimerization of nitrile groups, present in the perfluorobutenes by peroxides of bromo- or iodo-containing perfluorobutenes or by high energy radiation.

D. V. Sogah, Ithaca, NY, USA, *Design and Synthesis of New Nitroxyl Radicals and their Effect on Free Radical Polymerization of Styrene*. A new nitroxide, 2,5-dimethyl-2,5-diphenyl-1-pyrroline-1-oxide 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 most studied polymers are those of thiophenes, phenylene-vinylene and phenylenes. Use of fullerenes can quench effectively the 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, *Application 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 had been deposited on the substrate.

T. Kiteyama, Toyonaka, Osaka, Japan, Stereoregulation via Bulky Aluminum Phenoxide in Methyl Methacrylate Polymerization. Bulky aluminum phenoxides have been used to promote living polymerization of methacrylate, i.e. high-speed living polymerization, and screened living polymerization. The main roles of the bulky aluminum phenoxides is to activate the monomer and stabilize the propagating anion. Bulky aluminum phenoxide in combination with tertiary-butyl lithium can control livingness, stereospecificity and monomer selectivity in the polymerization and copolymerization of methacrylate in heterotactic living polymerization, syndiotactic polymerization of tertiary methylstyryl methacrylate and monomer-selective stereospecific copolymerization.

C. L. McCormick, Hattiesburg, MS, USA, Synthesis and Characterization of Phase Transfer Proteins, with Responsive Macromolecules for Water Remediation. Proteins which act as phase transfer agents to transport and store lipids in living organisms are well suited for the remediation of amphiphilic and hydrophobic materials from aqueous solution. Macromolecular complexes of proteins such as oleosins, hydrophobins and associated polysaccharides have been used to sequester a number of hydrophobic materials.

Y. Imashiki, Kyoto, Japan, Supramolecular Polypeptide Assembly in Lipid Bilayer Membrane, Air/Water Interface and Vesicular Self-Assembly. Monolayer formation of a hydrophobic peptide, was accomplished by tying this peptide to streptavidin and dispersing it in water. An amphiphilic α -helical peptide was synthesized and also dispersed which gave a peptide molecule assembly of spherical form with extremely narrow average diameter.

R. M. Otterbrite, Richmond, VA, USA, Unique Oral Drug Delivery Systems. Among the drug delivery systems available, oral drug delivery has many obvious advantages. A new protonoid oral drug system has been studied which consists of stable microspheres which are stable under acidic conditions (pH < 3). At higher pH (> 5), they disassemble, releasing the drug, which means that the microspheres are stable in the stomach but when they enter the upper gastro-intestinal tract they disassemble.

N. Yoda, Utsunomiya City, Japan, Recent Development of Advanced Functional Polymers for Semiconductor Devices and Electronic Applications. The potential for advanced materials in the superindustrial age of the next century is enormous and new materials and technology are required to satisfy new human demands for the well-being of mankind.

M. M. Coleman, University Park, PA, USA, 2,6-Dialkyl Substituted Poly(4-Vinyl phenol) Blends. Equilibrium constants describing self association versus interassociation together with the magnitude of the difference in non-hydrogen solubility parameters are dominant factors in determining the phase behavior of hydrogen bonded polymer blends. Various blends have been described, demonstrating this behavior pattern.

A. J. Heeger, Santa Barbara, CA, USA, Arrays of Polymer Gold Fingers with Common Grid: Smart "Neural Networks" for Image Processing. This arrangement is a conducting polymer device which provides local contrast gain control for image enhancement.

R. Samuels, Atlanta GA, USA, Characterization of the Molecular Properties of Chitosan. Chitosan is unique for its chemical, solution, structural, biological and physical properties. Chitosan is a polycation in acid solution. It can act as thickener

stabilizer or suspending agent and—it is edible. It may be useful as an encapsulating agent or as packaging material; it can absorb enzymes, anionic polysaccharides and metal ion—and can associate with food processing waste water—and could be useful for separation and purification processes.

PPC-4 also offered its attendees plenty of opportunities for social interactions. On Sunday evening the *Welcoming Reception* was held where the participants could meet old friends, or make new acquaintances.



At the Welcoming Reception

On Thursday evening, the *Luna*, the traditional Hawaiian cook-out was held in the spacious grounds of the Hyatt Regency Hotel, among the palm trees and other tropical vegetation, the lagoons, the pools and the ocean beach—a spectacular setting. 750 People, participants of PPC-4 and their families, gathered to celebrate an exceptional scientific meeting, full of opportunities for the exchange of scientific data as well as for the presentation of personal views and experiences.

On Tuesday evening, Professor Salamone, the President of the PPF, held a reception for the PPF Council Members and the invited speakers in his Hotel suite.

On Wednesday, Professor Salamone, called for the meeting of the Council. When the PPF was founded almost 10 years ago, the three founding members, polymer oriented organizations from the US, Japan and Australia met in Tokyo to sign the constitution of the PPF. Today the PPF has 16 member organizations, the membership application of two new organizations from Chile and Hong Kong were accepted and were added to the PPF, a Brazilian group asked for observer status. Among other business related to organizational matters, after a few years of functioning some modification of the constitution was necessary, as stipulated in the constitution. None of the modifications constitutes any significant changes of the objectives of the PPF, but only confirms the realities of a growing and healthy organization.

Chung Yup Kim of Korea was elected the new President of the PPF. He assumed office in the beginning of 1996. It was confirmed that the next Symposium, PPC-5 will be in Kyongju, Korea, October 26 to 30, 1997.

Feng Wang, of Beijing, China was elected the Vice-Chairman of the PPF. The Sixth Pacific Polymer Conference, PPC-6, will be held in China, probably in Guangzhou, before the end of the decade.