Fourth Pacific Polymer Conference: Koloa, Kauai

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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-paraph-
aphenylene featuring benzoxazine 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.

Samer El-Shal, Richmond, VA, USA, From Gas Phase Clusters to Polymers and Nanoparticles. A Route to Novel Materials: Intercluster catenation polymerization reactions possess a distinct form of chemistry that have not previously explored. In the gas phase at low pressure, exhaustive 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 polymerization requires a knowledge of the propagation rate constant k_p. The relatively new technique of pulsed laser polymerization (a photoinitiate with a pulsed laser) has been found to give reliable k_p values. Measurements at very low temperatures and with very short laser pulses gave excellent results for two monomers of interest in emulsion polymerization: butyl acrylate and acrylic acid.

Yasuhiko Kakei, Kawasaki, Japan, High-Speed Polymer Optical Fiber and Amplifiers. 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 Kagiyama, Fukuega, Japan, Surface Topographical and Mechanical Imaging of Polymer Blends. Dynamic viscoelastic characteristics at the polymer 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 microscopy. A number of blends were measured, including polystyrene/poly(vinyl methyl ether), as well as organosilane monolayers.
Stephen A. E. Chuang, and Frank W. Skolnik, Menlo Park, CA, USA. Acoustic Photopolymers as Optical Applications. In some cases, it has been recognized that the great promise of acousto-optic polymer waveguide devices is the potential for monolithic integration of acousto-optic and waveguide components. For this purpose, it is necessary to develop photopolymerization techniques that are compatible with the requirements of high-speed, high-density optical data storage. The development of such techniques is of great importance in the field of acousto-optic devices. The need for high-speed, high-density optical data storage is becoming increasingly apparent, and the development of the required photopolymerization techniques is a major challenge. The need for high-speed, high-density optical data storage is becoming increasingly apparent, and the development of the required photopolymerization techniques is a major challenge.

Yasuo Iwata, Tokyo, Japan. New Techniques for the Production of Polymeric Materials by Microwaves. Polymeric materials are used in many optical applications such as in optical communications. This is an important factor for the development of new optical communication systems. The need for high-speed, high-density optical data storage is becoming increasingly apparent, and the development of the required photopolymerization techniques is a major challenge. The need for high-speed, high-density optical data storage is becoming increasingly apparent, and the development of the required photopolymerization techniques is a major challenge.
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 purposed 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, Changzhou, China, The 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<sub>y</sub>) of the matrix, and the impact strength of the polymer blends.

Poipu Beach

Kazuo Saga, Ishikawa, Japan, Recent Progress in Heterogeneous Metalloocene Catalysts. Metalloocene catalysts have revolutionized the polymerization of α-olefins. The molecular design of the metalloocene ligands has yielded a variety of highly efficient catalysts. The new approach is to prepare various supported metalloocene catalysts, based on silica, alumina, magnesium chloride, polystyrene beads, and heteropolymers 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 tertiary AR, and improve the extent of catalyst selectivity.

R. Shashidhar, Washington, DC USA, Structure and Electric-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 retains a bulk-like structure after 6 layers. Pyroelectric properties of a number of nematic polymers 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 mesogenic 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-isopropylacrylamide) 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.

M. Gajwala, 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 aliphatic-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 polyethylene 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. Guarrasi, Thiais, France, Specificity and Limits of Organic-Based Electronic Devices. Various devices based on organic semiconductors have been prepared, mainly, photovoltaic cells, light emitting electroluminescent 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 base materials studies of thiophene oligomers and semiheteroaromatics 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. Although the wider acceptance of this waterborne system requires a thorough understanding of its structure-property relationship. And in addition hybrid acrylate polymers with polyurethane dispersions were also studied and gave interesting results.

H. K. Schmidt, Saarbrücken, Germany, Electrochromic Systems Based on Multi-phase Sid-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 self-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.
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 polysilane 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. Baudry, Blacksburg, VA, USA, The Effect of Methylated 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 copolymers. Maleic anhydride grafted polypropylene did not react with the liquid crystalline polymers, hydrogen bonding was believed to have compatibilizing effects of these blends.
polymers of microcrystals topically polymerized and homogeneously dispersed in the amorphous polymer.

F. 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 photocconductivity. 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. Wyman, Washington, DC, USA, Design, Synthesis, and Nonlinear Optical Properties of Syndiospecific Main Cation Chromophore Containing Polymer Blends. Systems have been developed where the chromophore is arranged in syndiospecific architecture and has amphiphilic character determined by the binding groups. These "accretion polymers" could be used to produce films with stable order nonlinear optical properties.

G. Lindsey, Chico, CA, USA, New Chromophoric Glassy Polymers and the Fabrication of Thermally Stable, Second-Order Nonlinear Optical Fibers. 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.

Dung Van Lay, Hanoi, Vietnam, Preparation and Swelling of Poly(ethylene Oxide) Complexes. Polyethylene oxide complexes have been studied over the years. Of recent interest was the complex of a naturally occurring polyamine carbamoyl methylcellulose and a natural polycation chosen, their swelling/deshinking behavior, and the use of such complexes in encapsulation technology.

Y. Chuja, Kyoto, Japan, Polysorganosiloxanealdriches by sideboration Polymerization. By hydroboration of monomer dimethylsilsilane complex with various stan-dienes, polymers were obtained that were excellent polymeric Lewis acids.

B. Yamada, Sapporo, 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 and cyclohexenyl methylcarboxylic deuterated in the methylcarboxylic 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 polyphenol 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 methylene units.

J. E. McGraith, Blacksburg, VA, USA, Enhancement of Properties via Incorporation of Hydrotrope Stabilized Aryl Phosphine Oxide. A number of new polymeric systems have been synthesized that have as their essential element aromatic phosphorus bonds. They include polyesters, polyarylenes ethers, polyamides and polyimides.

J. Köth, Potsdam, Germany, Phase Behavior of Polyurethane-Polyester Systems. Phenomena of phase separation due to polyurethane complex (complex) formation between different polyurethane components were investigated. The formation of stable simplex dispersions, flocculation, as well as coacervation processes were observed.

B. J. T. Hill, Brisbane, Australia, Microscale 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.

B. Raffé, 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 diatomic and viscoelastic relaxation behavior have been determined in polymers of methylmethacrylates and racemates.

J. M. J. Fréchet, Ithaca, NY, USA, Synthesis of Highly Branched Polymers with Enhanced Properties. Branched 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 AB, monomers.
M. Kamachi, Toyama, Japan, ESR Studies 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 compounds. 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. Macos, Clayton, Vic., Australia, Nanoe 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 aliphatics 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, trimethylolpropane, carboxylic acid and acid chloride functions.

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

T. Shimidzu, Kyoto, Japan, Ultimate Functional Polymer Materials: Conjugating Polymer Superlattices and Porphyra Array Connected with Molecular Wire. Artificial conjugating polymer superlattices and porphyra arrays connected with molecular wire have been prepared.

M. P. Ruhier, 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 heterostructures of conjugated polymers. Thin film light emitting devices have been fabricated based on poly(pyrrole-phenylene vinylene) and various non-conjugated polyimides.

S. A. Jenther, 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 towards 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, Photoinduced Degradation of Polymers by Metal Chlorides. Inorganic salts are well known photoinitiators of oxidative degradation of polymers. Photodegradation of water soluble polymers catalyzed by copper and iron oxides, especially polystyrene oxide) provides very interesting and useful systems for oxidative degradation using UV or visible radiation.

J. S. Ritchie, Blacksburg, VA, USA, Nitrile Functional 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 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. Lagathettis, Wilmington, DE, USA, Perfluorocarbons: Selection of Contouring Chemistry to Enhance Physical Properties. Perfluorocarbons with only carbon, fluorine and oxygen atoms are amorphous. They are excellent high-performance rubbers, when combined with other dimers/lockers, such as aromatic or aliphatic diamines or diols, by triimination of nitrile groups, present in the perfluorocarbons by peroxides of bromine or iodo-containing perfluorocarbons or by high energy radiation.

B. Y. Sugahara, Hhaca, NY, USA, Design and Synthesis of New Nitrile Radical and their Effect on Free Radical Polymerization of Styrene. A new nitrile, 2,5-dimethyl-2,5-diphenyl-2-pyrrolidinylonoxy and several analogs have been synthesized and found to mediate free radical living polymerization of styrene.

F. Wolf, Santa Barbara, CA, USA, Creating and Ammolding Conjugates with Conjugated Polymers. Within the area of conjugated polymers, research on electrochromic properties has become the main thrust, superseding research on improvement of conductivity and processability. The most studied polymers are those of diaphene, phenylene-vinylene and phenylene. Use of references 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 polymeric photosensitive 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 polyvinylsilane based on conjugated polymers as light emitting sources or on polyvinyl or polyimides which had been deposited on the substrate.
... T. Kitayama, Toyonaka, Osaka, Japan. Stereoregulation via Bulky Aluminate Phosphonate in Methyl Methacrylate Polymerization. Bulky aluminum phosphonates 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 phosphonates is to activate the monomer and stabilize the propagating anion. Bulky aluminum phosphonate in combination with tertiary-butyli lithium can control livingness, stereospecificity and stereoregularity in the polymerization and copolymerization of methacrylate in heteroatatic living polymerization, syndiotactic polymerization of tertiary methylstyril methacrylate and monomer-selective stereospecific copolymerization.

C. L. McCormick, Hainesburg, MS, USA. Synthesis and Characterization of Phosphonate Transfer Proteins with Responsive Macrodomains 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 amphipathic 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. Imanishi, 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 attaching this peptide to sepharose and dispersing it in water. An amphiphatic helical peptide was synthesized and also dispersed which gave a peptide molecule assembly of spherical form with extremely narrow average diameter.

M. Ottenhein, Richmond, VA, USA. Unique Oral Drug Delivery Systems. Among the drug delivery systems available, oral drug delivery has many obvious advantages. A new proteinoid 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, Urayasu 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-Dialitylated Substituted Polyvinylphenol 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. Hooper, Santa Barbara, CA, USA. Arrays of Polymer Gold Fields 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. Samuel, 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, amionic polysaccharides and metal ions—and can associate with food processing waste water—and could be useful for separation and purification processes.

PFC-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 Luau, 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 luau, the pool and the ocean beach—in a spectacular setting. 750 people, participants of PFC-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 Salamine, the President of the PPF, held a reception for the PPF Council Members and the invited speakers in his hotel suite.

On Wednesday, Professor Salamine, 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 constitute any significant changes of the objects of the PPF, but only conforms the realities of a growing and healthy organization.

Chung Yung 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, PFC-5 will be in Kyongju, Korea, October 26 to 30, 1997.

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