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5th Pacific Polymer Conference, Kyongju, Korea

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Conference Report

5th Pacific Polymer Conference, Kyongju, Korea

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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 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 years 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 Pendant- 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*.



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 Tooin 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, Taejon, Korea: *Synthesis of highly rigid cyclic olefin copolymers with metallocene catalysts.*

S. C. Ng of the National University of Singapore, Ke 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 sulfone) copolymers.*

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

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

P. Prasassarakieh of Chulalongkorn University, Bangkok, Thailand: *Preparation of natural rubber-g-methyl methacrylate (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 polystyrene 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, U.S.A.: *Thermotropic liquid crystalline polymers: present 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, U.S.A.: *EPR studies of two stable free radicals in polyvinyl 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 epoxy resin/polysulfone blends.*

T. I. Pudiyanto of the Petrochemical and Plastics Institute, 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., Samutpratkarn, 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 Wollagong, Wollagong, Australia: *Circular dichroism - A sensitive probe of conformational change in chiral polyanilines.*

G. G. Wallace of the University of Wollagong, Wollagong, 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 Pontificia University Catolica of 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 modification 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 Daclim 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 film 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 a conference attendees and guests. For the remaining presentation



**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.