

1987

Synthesis of Polymers and Polymer Liquid Crystals: A Euchem Conference in Lahti, Finland

Otto Vogl

University of Massachusetts - Amherst, vogl@polysci.umass.edu

Franciska Sundholm

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



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

Vogl, Otto and Sundholm, Franciska, "Synthesis of Polymers and Polymer Liquid Crystals: A Euchem Conference in Lahti, Finland" (1987). *Polymer News*. 182.

Retrieved from https://scholarworks.umass.edu/emeritus_sw/182

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

Franciska Sundholm and O. Vogl, *Synthesis of Polymers and Polymer Liquid Crystals: A Euechem Conference in Lahti, Finland*, *Polymer News*, **12**(8), 251-254 (1987)

Conference Reports

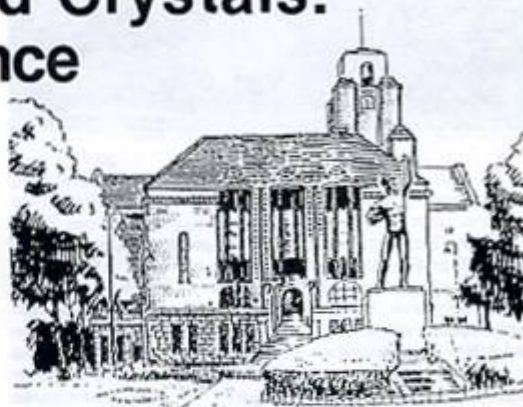
Synthesis of Polymers and Polymer Liquid Crystals: A Euechem Conference in Lahti, Finland

Franciska Sundholm* and Otto Vogl**

The EUCHEM conference on "The Synthesis of Polymers and Polymer Liquid Crystals" was held in Lahti, Finland, from August 19 to 22, 1986. The conference was sponsored by the University of Helsinki, the Academy of Finland, the Association of the Finnish Chemical Societies, the Ministry of Labor, the City Board of Lahti, the Neste OY Company, and a number of other institutions. One hundred and sixty participants from 20 countries congregated in Lahti, a city of nearly 100,000 which is about 100 kilometers north of Helsinki and is located in the southern part of the lake district of Finland.

Polymer science in Finland has made tremendous progress in the last decade. The universities have produced a number of graduate students with polymer background, and the Finnish and Scandinavian industry is looking for such graduates who are needed for their industry. One of the major companies involved in Finland is the Neste OY Company, the largest oil company in Scandinavia. This meeting not only concentrated on polymer synthesis and application, but was also intended as a means of honoring Prof. Johan Lindberg, the father of polymer science in Finland, on the occasion of his upcoming retirement.

The meeting started on Tuesday afternoon, April 19, 1986; it consisted of seven plenary lectures, about 25 lectures, and 30 presentations in poster form. A meeting of this kind in Finland allows participants and scientists from East and West to meet—in particular, to meet their Finnish colleagues. The meeting was held at the Conference Center Fellmanni in Lahti and was opened by Prof. Bengt Ranby of the Department of Polymer Technology of the Royal Institute of Technology in Stockholm. He described the life work of Prof. Lindberg and mentioned the important epochs in his career from his student days to his professorship and his role as the leader of the Department of Wood and Polymer Chemistry. It is now widely recognized that Prof. Lindberg has been the main mover in bringing modern polymer science to Finland and at the same time to combine the needs of wood products, to interact and interrelate with those of syn-



Otto Vogl



Franciska Sundholm



J. Johan Lindberg

thetic polymers. His major interest throughout his career has been his work on the structure and utilization of lignin and its degradation products.

*Department of Chemistry, University of Helsinki, Finland.

**Polytechnic University, Brooklyn, NY 11201.

Conference Reports



Conference Hall

In the first lecture, R. C. Schulz of the University of Mainz, F. D. R., described the "Synthesis of New Linear and Branched Copolymers." He presented several examples, particularly the living polymerizations of 2-isopropenyl-naphthalene, which has a relatively low ceiling temperature and a high glass transition temperature. It gives the opportunity to prepare diblock and triblock copolymers, for example with butadiene, dimethylsiloxane, or with ethylene oxide. The properties of the various compositions of these polymers were also described; macromonomers involving 2-isopropenyl-naphthalene, their ease of forming living polymers, and copolymerizations with *n*-butyl methacrylate were discussed. Another interesting group of polymers were those prepared from conidine by cationic polymerization. Again, copolymers of conidine and styrene could be prepared by using the so-called "mixed mechanism" technique.

New developments in "Photopolymerization and Photomodification of Polymers" were discussed by B. Ranby of the Royal Institute of Technology, Stockholm. In recent years in his laboratory, the photoinduced curing of surface coatings and the photocrosslinking of polyolefins and unsaturated polyesters as well as of ethylene/propylene/diene elastomers were studied. A most recent development is the surface modification of polymers by ultraviolet-initiated grafting. Ranby also found that the ultraviolet-initiated crosslinking of polyolefins is a rapid and efficient process, when irradiation initiator and added multifunctional monomers are optimized. Surface grafting of functional monomers onto polyolefins and polyesters initiated by ultraviolet light is now being developed further and can be carried out in the continuous apparatus on polymeric films.

"Recent Developments in Basic Research on α -Olefin Polymerization" was presented by P. Pino of the Eidgenössische Technische Hochschule in Zurich, Switzerland. The stereospecific polymerization of α -olefins continued to be the most investigated type of insertion polymerizations. A number of initiating systems were investigated, with particular emphasis on the α -olefin polymerization with soluble stereospecific initiators. The main goal of this research is still the achievement of the detailed knowledge of the structure of initiating centers in heterogeneous and homogeneous initiator systems. Systematic investigations have led to the proposal of a simple



The Town Hall of Lahti

stereochemical model for the transition states of the α -olefin insertion into a metal-to-carbon bond in coordination polymerization.

Otto Vogl of the Polytechnic University, Brooklyn, NY, discussed "New Developments in Coordination Polymerization." Functional groups in polymer structures have become increasingly important and have created polymers with new combinations of properties. Consequently, the development of methods for the polymerization of epoxides with functional groups has become necessary. With aluminumalkyls as modified anionic coordination initiators, ω -epoxyalkanoates have been polymerized; functional α -olefins with propylene-type initiating systems derived from titanium trichloride polymerized and copolymerized as long as the functional monomers are appropriately complexed.

These developments have become very important because of the need for new generations of polymeric stabilizers, of liquid crystalline polymers, particularly for information storage devices and also for electronically active polymers and potential candidates for nonlinear optics applications.

"The Synthesis of Chemically and Physically Crosslinked Macroporous Gels" was discussed by P. Flodin of the Chalmers University of Technology, Gothenburg, Sweden. Two major areas of gel preparation to retain high porosity after the removal of solvents have been developed by polymerization of polyfunctional monomers in the presence of solids or by dissolving polymers followed by the addition of a nonsolvent or by the evaporation of a solvent. Highly porous gels have been obtained with pore structures whose qualities varied depending on the structure of the styrene/divinylbenzene system. Preparation of macroporous gels and membranes from solutions involves the association of polymer molecules before liquid-liquid phase separation occurred.

G. W. Gray of the University of Hull, U.K., discussed "The Synthesis of Side Chain Liquid Crystal Polymers and the Role of Dispensity in These Systems." He concluded that the field of liquid crystals has been one of the most active research areas during the last decade, to a large extent as a consequence of commercially important applications of such materials in electro-optical displays. He distinguished between mesogenic units in the main chain where the liquid

Electronic Devices" was discussed by G. Biczko of the Central Research Institute of Chemistry in Budapest. Synthetic metals, liquid crystals, electroactive polymers, photochromes, and proteins were studied in an attempt to produce efficient molecular "wires", memory and display elements and switches. All of the results on one-electronic states were discussed.

The "Synthesis of Poly(methyl methacrylate) Microgels" was presented by N. B. Graham of the University of Strathclyde, Scotland, and M. Włodarczyk of the Technical University of Lodz, Poland. Methyl methacrylate was copolymerized with a number of multifunctional methacrylates in attempts to include crosslinking agents to produce microgels. Molecular weights and molecular weight distributions were studied.

An interesting lecture on the "Structure and Liquid Crystalline Properties of Poly(Esteramides)" was presented by D. Sek of the Polish Academy of Sciences, Zabrze. The influence of the position of ester and amide linkages in rigid mesogenic structures and the influence of the functional group's bonded mesogenic unit with flexible spacer on the ability to form thermotropic liquid crystalline mesophase and on phase transition temperatures were determined.

"Semi-Flexible Polyesters: Structure and Properties" was presented by R. Kotek, BASF Corporation, Anderson, South Carolina. The polyesters that were studied show a single crystal-to-isotropic phase transition; the entropy and enthalpy of these changes were studied.

"Chemical Stability of a Mesogenic Chain Fragment: A Condition for the Synthesis of Regular Thermotropic Liquid-Crystalline Polymers" was discussed by S. S. Skorokhodov of the Institution of Macromolecular Compounds, Leningrad, USSR. Thermotropic liquid-crystalline polyesters have been studied in an attempt to "tailor-make" the so-called "mesogenic fragments" similar to the structure and low molecular weight of liquid crystalline compounds. The effect of the method of controlling the molecular weight of thermotropic liquid crystalline polymers in their phase transition temperatures was also investigated on these polyesters.

"Injection Molding Studies on Thermotropic Liquid Crystal Polymers" was presented by E. Suokas of the Tampere University of Technology in Finland. The rheological behavior of thermotropic polymers is complex and not completely understood. The authors have started an investigation of the relationship between the processing conditions, the morphology, and the physical properties of injection-molded thermotropic copolyesters.

The "Synthesis of Melon Seed Oil Alkyd Resin: Effect of the Chain Length on Alkyd Property" was discussed by I. A. Ibemisi of the University of Nigeria. The "Modification and Application Studies of Natural Rubber" was presented by S. H. O. Egboh, also from Nigeria, who mentioned that in their laboratories natural rubber was grafted with acrylamide, methacrylamide and vinyl methyl ketone, and the graft polymers were identified.

The "Synthesis of New Polymers by the Reaction of Some Natural Products with Epoxy Compounds," presented by Z. K. Brzozowski of the Technical University, Warszawa, Poland, discussed polymers with multiple hydroxy groups which could be used for epoxy modifiers.

The "Synthesis of Heat Resistant Polymers from Phenols Related to Lignin" was presented by S. Hirose from the Industrial Products Research Institute, Ibaraki, Japan. The goal of this research was the synthesis of highly functional-

ized or high performance polymers from phenols which are produced by degradation of lignin.

Another paper related to the utilization of lignin was presented by H. Yoshida of the Department of Industrial Chemistry, Tokyo, who formerly worked at the Swedish Forest Products Research Laboratory in Stockholm; his talk was entitled "Effects of Crosslink Density and Kraft Lignin Content on Thermal and Mechanical Properties of Polyurethanes." Polyurethanes with various isocyanate/hydroxyl group ratios were synthesized using a Kraft lignin fraction obtained by successive extraction of bulk Kraft lignin with organic solvents. Additional work by the same group also utilized Kraft lignin; polyurethanes were prepared, then characterized.

As mentioned earlier, about 30 papers were presented in poster form. They included various contributions relating to the general subject of polymer synthesis and polymer liquid crystals.

The conference was not only concerned with the scientific presentations, discussions, and evaluations of the individual papers, but also welcomed the opportunity to explore the city of Lahti.

On Monday, the group was invited by the Mayor and the Board of Governors of the city to visit the beautiful City Hall which was built in 1912 when the city of Lahti had only 4,000 inhabitants. It was built by the foremost architect of Finland Eero Saarinen. The City Hall has been improved, was totally renovated in 1980 and is now serving a city of 100,000 inhabitants. The City is very industrialized and an important part of the economy of Finland. Lahti will function as the host of the 1989 Ski World Championships; the city has been known for many years for its excellent facilities in world class ski jumping competitions.

The Deputy Mayor greeted the members of the conference very warmly and provided an excellent basis for the interaction of the participants of the meetings, the understanding of the social structure and the culture of Finland, particularly outside of the capital city of Helsinki. A sketch of the City Hall is presented as the emblem of the Lahti meeting.

On Wednesday evening, the initiator/catalyst and father of the conference, Prof. Lindberg, was honored in many ways by students, by his workers and friends, by Finnish and Scandinavian industries, by many individuals, and by local and national societies. Everyone commented on the important impact that Prof. Lindberg had on the transition that the Finnish science has undergone from wood chemistry to the science of a mixture of wood, wood components, and, ultimately, to polymer chemistry. In a very skillful way Prof. Lindberg has guided polymer science to a carefully balanced cooperation between the natural resources of Finland, the industrial resources outside, and the intellectual background of students of Finland, the most valuable resource of manpower for Scandinavian industries, to the world-wide recognition of Finnish science, Finnish polymer science, and Finnish technology.

On Thursday one group of the participants visited the Neste OY oil refinery. Neste OY is the largest oil company of Scandinavia, the "Exxon" of northern Europe. Another group spent a congenial afternoon of personal interactions, scientific discussions, or just pleasant get-togethers on a boat trip through the connecting lakes on which Lahti is located. This interaction of people gave the opportunity of spending



Clockwise: J. Johan Lindberg, Mrs. P. Flodin, Mrs. J. Lindberg, and Otto Vogl



Boat Excursion

time talking about their scientific problems or just to understand each other a little better. On Friday noon, the participants departed with a warm thanks for the organizers, Professors Lindberg and Franciska Sundholm, which provided for a most efficient and thoughtful organization of the meeting.

Following the meeting, the IUPAC Commission on "Liquid Crystal Polymers" convened to discuss problems of research interactions and future direction of liquid crystals containing

polymers. This meeting was most capably organized and directed by Prof. N. Platé the new Director of the Topchiev Institute of Petrochemical Studies of the Academy of Sciences of the USSR.

The Symposium in Lahti, Finland, was one of the most successful conferences that has recently been held on the subject of "Polymer Synthesis and Related Subjects" and has already resulted in new inspirations, new ideas, and new scientific and personal friendships.