

1988

IUPAC “Macro 87” in Merseburg (GDR) Linking Tradition and Future in Polymer Science

Otto Vogl

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

Burkart Philipp

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 Philipp, Burkart, "IUPAC “Macro 87” in Merseburg (GDR) Linking Tradition and Future in Polymer Science" (1988). *Polymer News*. 157.

Retrieved from https://scholarworks.umass.edu/emeritus_sw/157

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.

Conference Reports

IUPAC "Macro 87" in Merseburg (GDR) Linking Tradition and Future in Polymer Science

Prof. Dr. Dr. hc. B. Philipp

Academy of Science of the GDR
Institute of Polymer Science E.C.
1530 Teltow-Seehof, Kantstr 55

With about 1000 participants from 39 countries all over the world and a multi-topic program covering all traditional and many new, rapidly expanding areas of polymer science "Macro 87" was this year's big event in polymer symposia.

been founded in 1954 and which now educates about 3000 students from more than 50 countries in the fields of chemistry, physics, mathematics, material and engineering sciences and economy. Organic polymers play a major role in the



View on a mediaeval part of the city of Merseburg

"Conference town and conference site were a good choice", many participants acknowledged. The city of Merseburg has a nearly 1000 years old tradition as a congress town, as already in the 11th century representatives of all German county sides joined in the emporal residence of Merseburg to hold a "Reichstag". The famous mediaeval ensemble of castle and cathedral is still the centre of the town, which is now an industrial city with 60,000 inhabitants amidst big chemical plants engaged in polymer synthesis and processing.

The participants of "Macro 87" were hosted in the campus of the "Carl Schorlemmer" Technical University, which had



Campus of the Carl Schorlemmer Technical University

University's teaching and research program. Fundamental and applied research in polymers includes topics like chemical and physical structure of high polymers, microstructure during the polymerization process, phase equilibria, application of new monomers, inhibitors and stabilizers, with the results achieved during the previous three decades promoting Merseburg to a centre of polymer science of international reputation.

The 31st IUPAC Macromolecular Symposium "Macro 87" took place from June 30 to July 4 and was organized by the "Carl Schorlemmer" Technical University of Merseburg represented by its President Margit T. Rätzsch, in cooperation with the Academy of Sciences of the German Democratic Republic and the Chemical Society of the GDR. In setting up the scientific program, it was the aim of the organizers

- to cover adequately established fields of polymer science relevant for optimizing large-scale polymer synthesis and

processing, as well as new developments now showing rapid progress especially at the borderline to microelectronics and optoelectronics at one hand, to the biomedical science at the other;

- to stress the integrative aspects of polymer science as shown by the fading of borderlines between polymer chemistry, polymer physics and polymer material science and technology;

- to assist in bridging the methodological gap between synthetic high polymers and macromolecular compounds encountered in nature;

- to bring together people not only from different fields of science, but also from different areas of professional activities, i.e. from academic research institutes, from the chemical industry engaged in large-scale production and processing of polymer, as well as from the numerous branches of science and technology applying organic high polymers.

Adequate consideration was given to the fact that future developments in polymers not only requires the search for new chemical structures and new solid state morphologies, but also a more detailed understanding of the mechanisms of structure formation as well as further efforts on establishing structure-property-relationships of polymer materials.



W. Scheler, President of the Academy of Science of the GDR, during his opening lecture on "Polymers in Medicine" in the Gewandhaus.

The opening ceremony of "Macro 87" was held in the famous concert-hall "Neues Gewandhaus" in Leipzig, with a smooth, well-organized bus-transport of all the participants from and to Merseburg. Opening addresses were given by the Deputy Prime Minister and Minister of Science and Technology of the GDR Dr. H. Weiz, who mentioned the pioneering role of chemical plants on the GDR territory in large-scale polymer production and processing, by Academician Margit T. Rätzsch, President of the Carl Schorlemmer Technical University, representing the host and the organizers of the symposium, and by Professor Dr. T. Saegusa from the University of Kyoto as the President of the Macromolecular Division of IUPAC. In his opening lectures on "Polymer in Biology and Medicine" the President of the Academy of Sciences of the GDR, Academician W. Scheler demonstrated



Margit T. Rätzsch, President of the Carl Schorlemmer Technical University and T. Saegusa, President of the Macromolecular Division of IUPAC, listening to the plenary program.

the ever closer connection between polymer science and the biological sciences from the biochemical and medical point of view. This close connection and cooperation between polymer and biomedical sciences can be traced back to Hermann Staudinger as the "founder of polymer science" about 60 years ago and is now centered on the mechanisms of interaction between polymers and living systems, as shown by W. Scheler on recent experimental results, accentuating research or achievements of institutes of the Academy in fields like immobilization and encapsulation of biologically active compounds and systems by functional polymers and poly-electrolytes as well as new applications of polymer membranes in surgical treatments. Synthetic polymers as "enzyme models" proved to be valuable tools in elucidating the mechanism of action of biocatalysts, and first achievements of practical relevance in controlled drug release from polymer-bound pharmlace were summarized by the author.

The symposium's scientific activities were continued in lecture-halls of the Carl Schorlemmer Technical University by presentation of plenary and invited lectures, oral communications and posters within the frame work of 8 micro-symposia running simultaneously and being centered on the topics:

- synthesis of polymers
- modification of polymers
- natural polymers
- structure and properties of polymers
- phase equilibria
- materials and technology
- special uses of polymers
- biomedical application of polymers

The first three topics comprised results and problems in already established areas of polymer chemistry, the next

Conference Reports

two were devoted to new results and ideas in the physics of organic polymers in the solid state and in solution inclusive developments in analytical techniques, and the topics of symposium 6, 7 and 8 were focussed on the impact of polymers to material science and engineering, electronics/optoelectronics and biomedical sciences.

As demonstrated by about 50 oral communications and about 200 posters in each of the first two symposia, the synthesis of new chemical polymer structures by covalent linking of monomers or by chemical modification of pre-formed macromolecules is still a challenge of high attractivity for polymer scientists. In polymer synthesis from monomers by chain reaction or step-wise homo- and copolymerization, the detailed mechanism and the further technical development of metal-complex catalysed polymerization received special attention by the plenary lectures of P. Sigwalt (France) on "Multiplicity of active species in transition metal based catalysts: the various reaction processes involved" and of J. Ulbricht (GDR) on "Ethylene polymerization with supported zirconium organic compounds". Progress in special mechanism of polymerization was also surveyed by H. Höcker (FRG) with regard to anionic and by W. J. Bailey with regard to free radical ring-opening polymerization.

Z. Jedlinski (Poland) reported on new classes of segmented polymers with hard and soft blocks. Unconventional monomers and their polymerization were the topics of T. Otsu (Japan) and T. Saegusa (Japan), the latter presenting results on graft and block copolymerization of 2-oxazoline to functional polymers.



O. Vogl, Herman F. Mark Professor at Brooklyn Polytech starting the plenary program with his lecture "Polymer modification to achieve novel properties", chaired by B. Philipp, Scientific Chairman of the Program Committee.

A comprehensive survey of the far-reaching possibilities of polymer modification for changing polymer properties was given by O. Vogl (USA) in his plenary lecture "Polymer modification to achieve novel properties", discerning between end-groups, main-chain and side chain modification, and accentuating the importance of telechelic and of suitable spacer-groups in tailoring macroscopic end-use properties, for example the compatibility in polymer blends. The plenary lecture of M. Fedtke (GDR) "Reactive oligomers and polymers" was focused on the mechanism and kinetics of

polymer networks formation via reactive epoxy-groups including new ways of acid curing of epoxy resins. The wide range of chemical reaction principles effective in modifying synthetic polymers to new products of practical relevance was further demonstrated by the lectures of F. Tüdös (Hungary) on oxydation of polyolefines, of J. Lemaire (France) on long-term photo-ageing of solid polymers, of K. Takemoto (Japan) on chemical modification of nucleic acid analogues, and of M. Kryszewski (Poland) on interfacial effect of filled polymers and blends.

The attention given by participants of "Macro 87" to the rather special microsymposium on natural polymers reflected the growing interest in remarkable resources and in modification of the polymers isolated therefrom. General scientific topics of this symposium was the close interrelation between changes in chemical and changes in physical structure of natural polymers during their isolation and modification. The plenary lecture of K. Fischer (GDR) "Changes in lignin and cellulose by irradiation" raised the point for lignocellulose and wood pulp during treatment with high energy radiation by presenting new experimental results on the chemistry and biochemistry of delignification in wood pulping, and on structural and reactivity changes of dissolving pulp under the influence of radiation. Problems of cellulose fine structure and cellulose reactivity were also the topic of lectures given by H. Chanzy (France) and H. Schleicher (GDR). W. Surewicz (Poland) gave an outlook on new chemical pulping processes, and J. J. Lindberg reported on different ways of chemically modifying lignin to new products. Contributions by H. Schierbaum et al (GDR) on starch-bond gels and by A. Thurn and W. Burchard (FRG) on casein micelles presented recent results on aqueous polymer gels.

The microsymposium on structure and properties of polymers covered aspects of structure characterization as well as of structure formation, giving special consideration to structure dynamics and structure-property relationships at one hand, recent results on the physics of polymer blends at the other. E. W. Fischer (FRG) showed in his plenary lecture "Neutron scattering studies of the structure of amorphous and crystalline polymers and of polymer blends" the neutron scattering techniques to be a powerful tool for elucidating structure and structure dynamics of polymers, considering especially problems and recent progress of this analytical technique and experimental results on homopolymer-copolymer blends.

W. Berger and H. W. Kammer (GDR) surveyed in their plenary lecture "Structure formation in polymer blends as the results of phase separation and deformation processes" their recent achievements in the thermodynamics of polymer compatibility and concluded from their experimental results a decisive influence of the viscosity and viscoelasticity ratio of matrix and dispersed phase on the structure of microheterogeneous polymer blends. H. Kausch (Switzerland) reported on the behavior of mobile chains in fields of force. E. L. Baer (USA) considered structure-property relations in oriented polypropylene. New results on formation, characterization and properties of polymer networks were presented in the lectures of R.S.T. Stepto (UK) and K. Dusek (CSSR).

Both the plenary lectures in the microsymposium on phase equilibria were considering the influence of molar mass distribution of polymers as a major point: Relying on experimental data from light scattering, H. Fujita (Japan) reported on the "Prediction of phase equilibrium behavior of quasi-

binary polymer solutions". "Polydispersity treated by continuous thermodynamics" was the topic of M. T. Rätzsch (GDR) in her review on polymer-relevant applications of continuous thermodynamics, the development of which has been decisively promoted by her work, opening new approaches to the thermodynamic treatment of polymer solutions, polymer melts and polymer blends also in connection with large-scale industrial processes. Invited lectures were given in this microsymposium by M. Gordon (UK) on modelling and data fitting in polymer thermodynamics, by R. Koningsveld (Netherlands) on polymer fluid phase equilibria, by H. Benoit (France) on thermodynamic aspects of light scattering of polymer in the melt and in solution, and by P. Kratochvíl (CSSR) on phase separation and fractionation of copolymers.

The microsymposium on materials and technology dealing with recent scientific achievements in polymer processing, was dominated by chemical and physical problems of polymer blends and composites, which were the topics of the plenary lectures of M. Rätzsch (GDR) "Possibilities of formation or modification of polymers by chemical reactions during processing" and of R. Simha (USA) "Configurational statistical thermodynamics of polymer mixtures and composites" as well as of the invited lectures given by T. Inoue (Japan) on phase behavior of polymer blends, by D. Heikens (Netherlands) on tailoring of polymer blend properties, and of P. Galli (Italy) on new frontiers in polymer blends. The two plenary lectures supplemented each other in an efficient way: M. Rätzsch discussed the chemical kinetics and chemical technology of "reaction processing" of polymers predominantly by extrusion giving examples of reactive blending for compatibility enhancement (polyamide 6 + nitrile rubber; ethylene-vinylacetate copolymer + polyurethane elastomer), while R. Simha offered a new theoretical approach to understand and predict structure-property relations of polymer blends.

As shown by the plenary lectures of H. H. Hörhold (GDR) "Poly-(phenylene vinylene)s-synthesis and electrochemistry of electroactive polymers" and of N. A. Platé (USSR) "Polymeric thermotropic liquid crystals—state of art, properties and structure" as well as by the invited lecture of I. Schopov (Bulgaria) on carbonyl-ethylene exchange reactions as a new route to conjugated polymers, many of the present and future applications of polymers on electronics, optoelectronics and optics can be traced back to two phenomena, i.e. the special electronic structure of conjugated chain polymers and the ability of some classes of polymers to form mesomorphic ("liquid crystalline") phases in the melt or in solution. By examples from his work on polyphenylvinylenes, H. H. Hörhold demonstrated the efficiency of a research strategy combining new routes of polymer synthesis with throughout and comprehensive physicochemical investigations of the products obtained, which may find future application in the storage of electrical energy as well as of optical data. This lecture and further contributions reflected the rapid development in the field of conductive and photoconductive polymers and their future potential as active devices in electronics. On the basis of experimental results of his own, N. A. Platé surveyed the synthesis and the structure-property relations of thermotropic side-chain polymers, accentuating transition phenomena between smectic

and nematic phases and the formation of cholesteric phases from polymers with partial helicity. As shown by this lecture and by further contributions, polymer liquid crystalline systems offer new routes to products of high mechanical performance and to new electronic switching and storage devices.

The microsymposium on biomedical applications of polymers conveyed an impressive overview on the rapid and widely diversified development in this interdisciplinary field of science. Compatibility of polymers with living cells and tissue is to be considered here as an area of rapid progress, which nevertheless offers numerous challenging open problems. The system "polymer-blood" obviously is of special interest here, as shown by the plenary lecture of T. Tsuruta (Japan) "Biomedical behaviour of some amino-containing polymers in contact with blood constituents", dealing predominantly with the sorption of blood platelets and lymphocytes on polyelectrolyte-modified polymer surfaces and with the haemophilization of membranes, and by the invited lectures of M. Jozefowicz (France) on interaction of heparinoids with blood and of V. Kabanov (USSR) on interaction of charged latices and cells with synthetic polyelectrolytes.

The plenary lecture of J. Kalal (CSSR) "Synthetic polymer in drug preparation" summarized the ample experience from the author's joint research work with surgeons on the interaction of polymer implantates and drug carriers with living matter, including the problem of polymer degradation and excretion of polymers and polymer fragments. Special classes of polymers in contact with living tissue were considered in the plenary lecture of H. Frommelt and R. Becker (GDR) "Polymers for medical application", covering the application of polyurethanes as implantate especially for substituting kidney and heart functions, and in the invited lectures of A. C. Albertsson (Sweden) on degradable polyesters as biomaterials.

Resuming the activities and achievements of "Macro 87", it can first of all be stated that the scientific level of lectures, communications and posters fully met the expectation of organizers and participants. Organic polymers obviously are still a challenge to scientists in many fields, further progress arising from synthesis of new classes of polymers as well as from the formation of novel morphologies with special end-use properties. As a prerequisite of tailoring polymers for new applications as well as for a further optimization of current production processes, progress in theoretical modelling and analytical characterization of polymer structures, structural changes and structural interactions have to be considered. An increasingly interdisciplinary character of polymer science and a growing importance of organic polymers for realizing high technology became clearly visible at the symposium. Last but not least the stimulating conference climate of "Macro 87" is to be mentioned here, which was promoted by getting all participants together in an University campus, by accentuating poster sessions as "crystallization nuclei" for lively scientific discussions, and of course, by the cordial hospitality and the efficient organization provided by the staff of the "Carl Schorlemmer" Technical University. The next "Macro" will be organized in 1988 in Tokyo, as announced by Professor Saegusa in an address of invitation during the closing ceremony at Merseburg.