2001

INSTITUTSDAGEN at the Royal Institute of Technology, Stockholm, Sweden, May 3, 2000

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Otto Vogl and Ann Christine Albertsson, *INSTITUTSDAGEN at the Royal Institute of Technology, Stockholm, Sweden, May 3, 2000,* Polymer News, 26(2), 64-67 (2001); Progress in Polymer Science, 26, 1139-1146 (2001)

Conference Report

INSTITUTIONSDAGEN At the Royal Institute of Technology Stockholm, Sweden, May 3, 2000

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Bengt Rånby

Ann Christine Albertsson

Under the title INSTITUTIONSDAGEN which could be translated from Swedish into English as Department Meeting, an International Symposium was arranged at the Royal Institute of Technology, Stockholm, Sweden to honor Professor Bengt Rånby on his 80th birthday. Bengt Rånby is the founder of the Department of Polymer Technology at the Royal Institute of Technology in Stockholm and for 25 years was its head and guiding light. A large and impressive International Symposium was held in Stockholm for Bengts 75th birthday five years ago which was attended by scientists from all over the world. [Otto Vogl and Ann Christine Albertsson, J. Macromol Sci., Pure and Applied Chem., A33(10), (1997)]. This time the Symposium was more modest because it was intended for close friends of Professor Rånby and students of the Department of Polymer Technology.

The "real" celebration of Rånbys 80th birthday was reserved for an International Symposium in China, two days after the meeting in Stockholm. The International Conference on "New Trends in Functional Polymers" was to be held in the Huangshan (Yellow Mountains) in Anhui, China from May 8–13, 2000 under the Chairmenship of Fosong Wang, Ann Christine Albertsson, Caiyuan Pan and Wengfang Shi. It included Precision Synthesis of Functional Polymers; Bio-and Medical Polymers; Functional Polymers; Structures and Properties of Functional Polymers and Industrial Applications.

Included in the program was a celebration to honor Bengt Rånby as a scientist and inspiration for the development of polymer science in China. Bengt Rånby was instrumental in educating a number of Chinese polymer scientists in Sweden and now holds the position of an Adjunct Professor at the Department of Applied Chemistry, University of Science and Technology in Anhui, China. The first International Conference on Polymers entitled "Functional Polymers" was held in Kunming, Yunnan, China in 1981. Professor Otto Vogl was the opening speaker at the meeting in Kunming and now in Stockholm at this time he again was one of the speakers.

This meeting which was held at the Royal Institute of Technology was a very intimate meeting that included three International speakers and was designed to be attended by friends of Bengt Rånby and students of the department.

The three main speakers were friends of Rånby and represented the forefront of polymer research, as we know it. They included

Polymer News, 2001, Vol. 26, pp. 64–67
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Otto Vogl, Helmut Ringsdorf, Virgil Percec

Professor Helmut Ringsdorf, University of Mainz, Mainz, Germany, Professor Virgil Percec, Department of Chemistry, University of Pennsylvania, Philadelphia, PA, USA and Professor Otto Vogl, Department of Science and Engineering, University of Massachusetts Amherst, MA, USA.

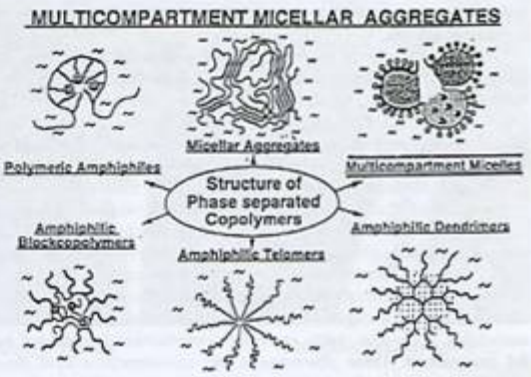
The meeting was organized by Ann Christine Albertsson, the Head of the Department of Polymer Technology with the cooperation of Professors Ulf Gedde, Sigbritt Karlsson and Bengt Stenberg.

The Symposium was opened with a lecture by Professor Helmut Ringsdorf, Mainz, Germany in cooperation with P. Lehmann and R. Weberskirch:

Multicompartmentation – a Concept for the Molecular Architecture of Life. Polymeric Multicompartment Micelles as a Synthetic Approach

Helmut Ringsdorf

One of the basic concepts for the molecular architecture and the molecular engineering of living systems is their compartmentation. On a biological level cells with thier essential organelles are perfect examples. On a molecular level multienzyme complexes and multicompartment transport proteins demonstrate the effect. What about synthetic approaches?



Internal phase separation of hydrophobic units – e.g. fluorocarbons and hydrocarbons – in polymeric micellar systems opens synthetic routes. They were discussed on the basis of oxazoline and acrylic acid copolymers with the corresponding hydrophobic comonomers. One further step towards the attempt to mimic natural systems is the preparation of polymeric micelles with patched surfaces. Induced by the phase separation within the hydrophobic core micelles with defined patches of different hydrophilic head groups are preparable. In addition solubility dependant specific encapsulation of substrates and/or catalysts may lead to selective reactions in and through the different domains. Application possibilities: Many!

Professor Virgil Percec of Philadelphia, PA, USA, discussed:

Nature as a Model for the Creation of New Concepts in Macromolecular Science

Virgil Percec

Over long time periods, nature has been able to design and optimize complex molecular, supramolecular and macromolecular nanosystems based on building blocks of natural polymers: nucleic acids, proteins and polysaccharides. Complex structures have evolved such as the fluid mosaic structures of cell membrane, viruses and complexes of DNA and proteins. They are based on the needed structures for intended functions, their capabilities of self-assembly or their

appropriate configuration and conformation during the synthesis of the nanostructures.

In the present state of polymer science we analyze the systems by using scattering of light, x-rays, electrons, neutrons. We introduce the results of the analyses into the theory or we develop models. Our ability ro draw useful conclusions is often limited to simple and primitive supramolecular structures. New concepts of advanced molecular structures have to be developed to achieve further progress which can become the "rate determining steps" for furture progress.

One of these challenges is based on the DNA catenane, a "single loop" DNA chain. Controlled polymerization mechanism visualizes shape and chain conformation via self-assembling dendritic building blocks. Percec pointed out more or less stable "more or less sociable" quasi-equivalent conformations during the self-assembly of icosahedral viruses. The energy to drive the change from the more stable unsociable to the less stable associate conformation is provided by the intersubunit. These observations and considerations have their analogs in biology, chemistry, society, economics, politics and private life.

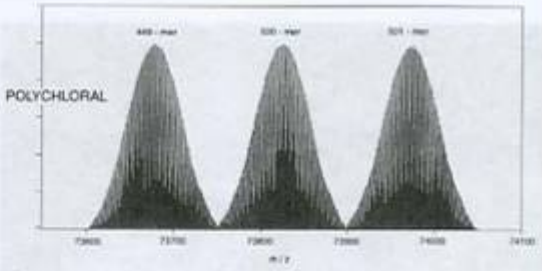
Professor Otto Vogl, Amherst, MA, USA, in cooperation with Gary D. Jaycox and William J. Simonsick *Jr.* presented their work on:

Isotopically Pure Uniform Polymers

Otto Vogl

Polymers usually exist as mixtures of macromolecules of different molecular weight. When prepared by random initiation processes, they typically have molecular weight distributions (M_w/M_n) of 2. When initiation is essentially complete, and when no spontaneous termination occurs, "living polymers" with M_w/M_n values near unity can be obtained. However, living polymers, as normally prepared, still do not have an exact molecular weight distribution of 1.000. "Uniform polymers" – polymers that are single macromolecules, can be and have been isolated. At this time, uniform polymers cannot be directly synthesized, only nature can do that in selected natural polymers. For example, DNA's, uniform polymers of nucleic acids, serve as templates for the synthesis of proteins. Specific proteins can act as catalysts, for example, for the enzymatic synthesis of polysaccharides, in this case, polymers of broad molecular weight distribution are obtained.

Typical macromoleculaes are constructed from atomic building blocks having natural isotope abundances. C, H, O, and N each have



several isotopes, even though most occur only in small quantities. We have investigated the possibilities and calculated the number of different isotope species for several macromolecular systems. For example, for polychloral $(C_2HOCl_3)n$ with a DP=500 with a threshold sensitivity of 1:2000 over 3600 distinct isotope species can be calculated to exist in significant amounts. In polypropylene $(C_3H_6)n$ 160 species can be identified. In poly(methyl methacrylate) $(C_5H_8O_2)n$ 4400 and the natural protein vasopressin with a molecular weight of 1071 shows 123 discreet isotopic species. From our calculations it is clear that even uniform polymer species are not completely uniform but consists of isotopes in their natural abundance. Isotopically pure uniform macromolecules are being and remain to be investigated.

Carbon-hydrogen isotope effects have been extensively studied in small molecules. Naturally occurring "fractionation processes" provide important clues for understanding geological systems on Earth. But how important might isotope effects be in larger macromolecules, synthetic and natural? We know that polyethylene has been highly enriched in deuterium, forms immiscible blends with its more "normal cousin". What other interesting effects await our discovery?

The special lectures were followed by a reception where it was possible for the speakers to interact with students. Most members of the faculty of the Department also attended which allowed interactions with the students and the senior members of the faculty. It

At the reception

A.C. Albertsson Börje Östman

Andres Hult

Bengt Rånby Torbjörn Westermark

At the Dinner
Andres Björklund Ulf Gedde

At the Dinner

was also gratifying to have the Dean of the Chemical Sciences, Andres Hult, also a former student of Professor Rånby, present for this occasion.

After the reception a buffet dinner was prepared at the Restaurant Quantum on the Campus of the Royal Institute of Technology to conclude a most impressive event. The after dinner speaker was Professor Westermark, a member of the Swedish Academy of Sciences and a High School friend of Professor Rånby. He told us how life was in the North of Sweden 70 years ago, when Bengt had just come from the family farm and how he succeeded in High School and then he went on to Uppsala University for his Ph.D. to work with the famous Nobel Laureate, The Svedberg. Bengt became the Assistant to Svedberg in Uppsala and then went on to America. He spend some time in the USA in Academia and Industry and was called back to Sweden to create the Department of Polymer Technology. He is now recognized as the father of modern polymer science in Sweden and in Scandinavia.

The meeting had many moving moments. One of Rånby's sayings is: Be nice to your students, one of them may become your boss!! And many more of his famous quotations were mentioned.

We wish Bengt Rånby many more years of good health, and full recognition for all the scientific and professional contributions he has made for polymer science in Sweden, Scandinavia and the world. AD MULTOS ANNOS.

Acknowledgement

We would like to express our appreciation to Bjorn Olander, Department of Polymer Technology, Royal Institute of Technology, Stockholm, Sweden for his help during the Symposium and the preparation of this manuscript.