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POLYMER SCIENCE IN LODZ, POLAND
by
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Lodz, a city of about 800,000 inhabitants, is located in the geographic center of Poland and has been the center of the textile industry of this part of Europe for over 150 years. Not surprisingly, research and teaching of polymer chemistry have developed in Lodz, especially after the second World War. Lodz has a Technical University (Politechnika Lodzka), and an Institute of the Polish Academy of Sciences, the Centre of Molecular and Macromolecular Studies.

The Centre of Molecular and Macromolecular Studies was created in 1972 and, under the directorship of Professor Jan Michalski, has become an important center of research in organic chemistry and polymer science. Professor Michalski, Academician and former Secretary of the Division of Natural Sciences of the Polish Academy of Sciences, is now the Chairman of the Committee of Chemistry of the Polish Academy of Sciences and is also the President of the Lodz branch of the Polish Academy. An organic chemist and world authority in phosphorus chemistry, his main interest is in the synthesis and mechanism of reactions and stereochemistry of phosphorus compounds and in polymer chemistry.

Under the leadership of Professor Michalski and Professor Marian Kryszewski, corresponding member of the Academy, Director of the Polymer Institute and Deputy Director of the Centre, polymer science has become an important component of the activities of the Centre and constitutes about 40% of the overall research effort and manpower deployment. Professor Kryszewski is well known in the U.S.: his initial stay was at Brooklyn Polytechnic Institute in the early 1960's and since then he has made frequent visits to this country. Professor Kryszewski has maintained a broad interest in the area of polymer physics and polymer physical chemistry. He has worked on characteristics of the solid state of polymers, electrical properties, the mechanism of conductivity in dielectrics and semiconductive polymers. Particular emphasis has recently been placed on mixing behavior of polymers and the measurement and interpretation of physical and mechanical properties of polymers using various techniques for effective characterization of the polymers. Professor Kryszewski also has responsibilities at the Technical University in Lodz and at this institution has an active research group working in the

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field of polymer degradation and stabilization as well as on conductivity of doped polymer systems.

Professor Stanislaw Penczek has over the last ten years developed a strong research group involved in kinetics and mechanisms of polymerization. His group was responsible for the development of a number of new concepts in cationic and ring opening polymerization, especially in the polymerization of cyclic ethers and cyclic acetals. Associate Professor Przemyslaw Kubisa and a number of other scientists with advanced degrees are also active in research on ring opening polymerization. The mechanism of propagation and termination of cyclic ether polymerization and copolymerization has been extensively studied, with particular emphasis on the structure of the propagating cation, possible ion-ester equilibria and rate constant of propagation of ionic and non-ionic species. From this group, polymers with important and potentially important practical applications such as polymers and copolymers of trioxane with 1,3-dioxolane and other cyclic ethers have been developed. These studies have resulted in technical processes of copolymers of polyoxymethylene. Polymerization studies of cyclic phosphates and phosphonates investigated by this group in connection with the phosphorus group of the organic division of the Centre have led to the new synthetic method for preparation of models of biopolymers of nucleic acid.

Another important area of investigation is the copolymerization of sulfur with episulfides. It is known that sulfur is a cyclic octamer which can be polymerized by thermal means. It has now been found that sulfur can be copolymerized with cyclic episulfides by an anionic polymerization mechanism to polymers with a sulfur content of over 90% which have reasonable thermal stability.

The group of Associate Professor Julian Chojnowski is primarily interested in silicon containing polymers and copolymers, mechanisms of polymerization, and properties of these polymers. They are of great interest for their thermal, oxidative stability, and also for their selective permeation characteristics.

A total of about 50 people are involved in research of polymer science at the Centre of Molecular and Macromolecular Studies in Lodz, of which nearly one-half are scientists with advanced degrees.

The Technical University in Lodz has two departments in which polymer science is an important component: in the department of chemistry and in the department of textiles. The department of chemistry has an Institute of Polymer Science which is primarily concerned with elastomers and rubber technology; chemistry of polyamides and silicones, leather technology and polymer physics. In the department of textiles there is an Institute of Synthetic Fibers.

In the Institute of Polymer Science, with Professor Jerzy Rucinski as the Director, the following professors are concerned with research and teaching of polymer science: Professors Zygmunt Lasocki and Marian Kryszewski, and Associate Professors Krawiecki, Studniarski, Slusarski, and Wlodarczyk. The Director of the Institute, Professor Rucinski, is a specialist in synthetic rubbers, particularly in the structural changes in vulcanisates caused by free-radical modified vinyl polymers as fillers for elastomers. Professor Lasocki, the former Dean of Science of the Technical University in Lodz and a corresponding member of the Polish Academy of Sciences, is also the Secretary of the Lodz branch of the Polish Academy of Sciences. He is interested in polymer silicon chemistry, particularly silicon rubbers, and also in transition metal chemistry. Other research interests of the Institute are the synthesis and characterization of polyamides, and grafting of collagen on vinyl polymers.

In the Institute of Radiation Techniques, Professor Jerzy Kroh is investigating the influence of irradiation (for sterilization) on the structure and properties of synthetic fibers. Other studies on polymers or polymerization include the radiation polymerization of methyl methacrylate and the solid state polymerization of N-vinylcarbazole.