Polymer Science and Engineering in Academy Institutes in the Northern Part of the People's Republic of China (North of the Yangtze): Part I: Beijing"

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Beijing (Peking), a city of seven million inhabitants, is the capital of the People's Republic of China and the country's political, economic and cultural center. It is situated in the northeast of central Hopei Province. The history of Beijing dates back to the 12th century B.C. and after the founding of the People's Republic of China, this old city gained new and increased importance.

In the People's Republic of China, the scientific research organizations consist of the Chinese Academy of Sciences, universities and colleges, research institutes of industry and defense, and regional research institutions. All institutions collaborate for a common objective and share in developing science and technology in China.

54 Universities and colleges and over a hundred different kinds of research institutes are located within the city. The Chinese Academy of Sciences (Academia Sinica), China's highest ranking academic organization and center for research in the natural sciences has its headquarters in Beijing. The principle goal of the Academia Sinica is to emphasize the basic aspects of scientific research, to raise the scientific level of the nation and to attend to the needs of national economy and national defense. The research institutes of the Academia Sinica form the basic units of the Academy and it is there where most of its research is carried out. At present there are 117 Academy Institutes in the People's Republic of China.

The Institute of Chemistry, Beijing, Hopei Province

The Institute of Chemistry was founded in 1956 to carry out research and gather knowledge in chemistry. The Institute is located in the western suburb of Beijing; this part of the city was originally planned to be the academic section of the city and a number of universities and research institutes are found in this area.

The Institute of Chemistry is one of the 15 institutes of chemistry in the country which are part of the Academia Sinica. The Institute has about 450 academically trained scientists including 60 research professors or associate professors; the research objectives of the Institute are concerned with basic and applied research in the fields of polymer chemistry, polymer physics, physical chemistry, analytical chemistry (mainly organic analytical chemistry) and organic synthesis. Research in polymer science constitutes nearly 60% of the total scientific activities of the Institute of Chemistry. This apparent imbalance in research and some insufficiency in organic chemistry was the result of the creation several years ago of three new institutes from the Institute of Chemistry. A substantial number of organic chemists and inorganic chemists were transferred from the Institute to these newly created institutions. The Institute of Chemistry consists of eleven laboratories (of these, six laboratories are directly involved in polymer science) which carry out research

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on polymer synthesis, organic physical chemistry, organosilicon chemistry, polymer supported catalysts, organic conductors, organic photoconductors, polymers with special properties, polymer composites, analytic chemistry, chemical kinetics, precision calorimetry, spectroscopy, NMR spectroscopy, crystallography and polymer physics in general. In addition, there is an instrumentation workshop, a machine workshop, a glass-blowing workshop and information services.

Professor Renyuan Qian is now the Director of the Institute; he is one of the pioneers and leaders in polymer physics research in China and is interested in many aspects of polymer physics: solution properties of high polymers (molecular weight and molecular weight distribution, conformation and size of polymer molecules in solution and interaction between polymer and solvent molecules), spectroscopy of high polymers, dielectric and dynamic mechanical properties of high polymers, rheology of polymer melts and morphology of high polymers. Professor Qian is working on characterization and structure determination of polymers and on structure-property relationships of polymers including the study of rheology and processing.

A substantial amount of work has been done on the spinning of polypropylene fibers. Equipment was developed to study by laser Doppler velocimetry the velocity profile in the convergent flow of polymeric fluids and the acoustic emission of polymers during stretching. His studies on polymer excimers in various solvents and different concentrations confirmed that excimer formation exists between nonadjacent chromophores in the chain and between interchain chromophores. Polymer molecules were found to contract long before the transition from a dilute solution to a more concentrated solution. In recent years, Professor Qian extended his interests to the study of photoconductivity and metal conductivity in organic solids including polymers. Polyacetylene films of fibrillar and granular morphology have been characterized. Single crystal diffraction pattern on trans-polyacetylene has been obtained by electron diffraction leading to the establishment of an ortho-rhombic structure for this polymer. True metal temperature dependence of the conductivity of doped polyacetylene films has been successfully observed by Voltage Shorted Compaction measurements.

Professor Qian and his colleagues formed the first faculty of polymer physics in the University of Science and Technology of China in 1958 starting polymer physics education in Chinese universities.

Professor Baoren Wang, Vice Director of the Institute, is one of the pioneers of polymer chemistry research in the People's Republic of China. His interests cover large areas of polymer chemistry. He has carried out very careful studies on the polymerization process of caprolactam and the polycondensation of ω-amino acids. His interests are also focussed on the problem of synthesizing silicone polymers with different structural units in the main chain and the side chain and on the relationship between structure and properties of polymers. He has organized research groups responsible for the development of adhesives, aromatic polyamides, and polymers with heterocyclic groups in the polymer chains. Professor Wang and his colleagues organized one of the early faculties on polymer chemistry in the University of Science and Technology of China in 1958 starting polymer chemistry education in Chinese universities. Professor Wang has also served and is still serving as the Chairman of the Polymer Division of the Chinese Chemical Society and has been editor-in-chief for the journal "Polymer Communications" since its first publication in 1957. "Polymer Communications" is the most important Chinese journal devoted to polymer science. Starting from October, 1983, an English edition of this journal will be published.

Laboratory of Polymer Physics

Professor Lianghe Shi is the Deputy Director of the Institute and also assists Professor Qian in handling the international relations of the Institute. For many years he has been interested in the studies of solution properties of high polymers, the development of methods for the determination of molecular weight and molecular weight distributions. In recent years, Professor Shi and his colleagues have been concentrating on the studies of gel permeation chromatography. They have developed their own gel permeation chromatograph including packing materials for the GPC columns and have commercialized this design. Professor Shi's interests are also concerned with the problems of experimental techniques, data treatment and the applications of the GPC method, for example for the determination of the degree of branching of polymers. Professor Shi has also worked on the homogeneous chlorination of polyethylene and the characterization of chlorinated polyethylene by carbon-13 NMR spectroscopy. Transition and phase changes of polyblends containing chlorinated polyethylene and poly(methyl methacrylate) have also been studied.

For many years Associate Professor Qicong Ying has been working on solution properties. Her early investigations were carried out on phase separations, basic studies on fractionation as well as the determination of molecular weight and molecular weight distribution by ultracentrifugation. Recently she has become interested in laser light scattering techniques and has studied the dynamic laser light scattering of aromatic polyamides in solution.

Associate Professor Shannong Zhu's interests involve

studies of chain structure of polymers by infrared and nuclear magnetic resonance spectroscopy.

Associate Professor Mao Xu is working on the determination of dynamic mechanical properties and the morphology of crystalline polymers by small angle light scattering techniques and by electron microscopy.

Associate Professor Duanfu Xu has been working on the crystallization process of segmented copolymers and amorphous isotactic polypropylene glass and its glass transition temperature.

Associate Professor Zingzhou Hu's present research objectives include studies on the photostabilization of the tetra- and pentamethylhydroxypiperidines and their derivatives on the effect of the photooxidation of polypropylene.

Laboratory of Polymer Composites

Professor Renjie Wu, Deputy Director of the Institute has been interested in dynamic mechanical properties of high polymers. Recently he has concentrated on the investigation of interfacial problems of polymer composites of glass fiber and carbon fiber. An electro-deposition technique is being used to deposit polymers on the surface of carbon fiber which gives better adhesion of the polymer onto the fiber.

Associate Professors Zongneng Qi and Xiugang Wang working with Professor Wu are interested in the problems of interactions on polymer interfaces.

Laboratory of Organosilicon Polymers

Professor Yi Lin is one of the pioneers of silicone polymer research in the People's Republic of China. He has worked on many aspects of silicone polymer chemistry including monomer preparation, mechanism of polymerization and applications of silicone polymers. Professor Lin, in general, has organized research groups responsible for the development of silicone polymer chemistry. With his coworkers he is presently interested in the studies on emulsion polymerization, particularly the mechanism of cationic and anionic emulsion polymerization of octamethylcyclotetrasiloxane.

Associate Professor Shuman Sun is involved in the synthesis of polymers with specific functional groups for biological and medical effectiveness.

Associate Professor Guangliang Li is working on silica-silicone oil dispersion as well as on the stress relaxation of silicone rubbers.

Associate Professor Guanli Wu is studying room temperature setting of silicone adhesives and their applications. She is now interested in synthesizing new organo-silicone and boron compounds, such as silatranes and boratranes.

Laboratory of Heterochain Polymers and Adhesives

Professor Zhitang Huang and his colleagues are investigating the curing process and thermal degradation of phenol-formaldehyde resins. They are also interested in dicarboxylic acid anhydride capped polyimides and their composites and the thermal polymerization of dicarboximide. Recently they have been concentrating on the study of aromatic and heterocyclic dinitriles and their polymers and have synthesized and polymerized a series of dinitriles with benzoxazole, benzothiazole, benzoxazinone, phthalimide and other rings in the polymer chain.

Associate Professor Fengcai Lu and her coworkers are studying the preparation of polyphenyltriazines from dicyanobenzene and terephthalamidrazine. Their other interest is the preparation and properties of polyphenylquinoxaline.

Associate Professors Zengpei Ge and Xuzong Nie have for many years been, and are still, interested in the synthesis of a wide variety of special adhesives and their applications.

Laboratory of Polymer Synthesis

Professor Baoren Wang has organized many research groups responsible for the development of a variety of polymers.

Associate Professor Zhifen Li's early work was on the synthesis and electric properties of conjugated macromolecules of poly Schiff base structure. Her present interests are focussed on problems of effects of poly(vinyl acetate) and poly(styrenesulfonic acid) on the polymerization of acrylamide with redox initiator system. Associate Professor Youhuai Wang's interest is the polymerization of ω-caprolactam especially the monomer casting polymerization of ω-caprolactam. Associate Professor Ruinian Zhao is working on the free radical homo- and copolymerization of tetramethylpiperidinyl acrylate. Associate Professors Guanghua Xie and Shijing Xiao are working on catalyst systems for the polymerization of propylene to isotactic polypropylene. Associate Professor Dekang Shen is studying the modification of polypropylene fiber by a copolymer containing tetramethylpiperidinyl methacrylate. Associate Professor Jingsheng Bao and her co-workers are concentrating on the studies of poly (phenylene terephthalamide). Associate Professor Meiyan Wu is investigating multiblock copolymers of polyesters having terephthalate and polyether units in the polymers.

Laboratory of Polymer Supported Catalysts

Professor Yingyian Jiang's early work was concerned with a wide range of studies on silicone polymers. His recent interest has turned to the synthesis of polymer supported catalysts and a series of them have been synthesized and characterized; their possible applications and uses are now being explored.

Associate Professor Hanfan Liu is working on the use of catalytic hydrogenation of some polymer supported catalysts and on the characterization of these catalysts.

Associate Professor Xiuchang Zhu's early work was concerned with ion exchange resins. At present he is studying the synthesis of polytetraphenylporphyrin and its manganese complex and dis-bipyridine ruthenium complexes of polymers.