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Centers of Polymer Research; Polymer Science in Tokyo, Japan, Part III: Suburban Area

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Polymer Science in Tokyo, Japan. Part III: Suburban Area, Kanagawa and Chiba Prefecture



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In Part I of the series, the polymer research activities in central Tokyo, and in Part II polymer research in Universities of the suburban area (outside the Yamanote line), particularly at the Tokyo Institute of Technology, were described. In this article we are concluding the polymer activities in laboratories of suburban Tokyo and present also a brief summary of the activities located in the neighboring Kanagawa and Chiba prefectures.

Tokyo University of Agriculture and Technology

Located about 30 km west from the center of Tokyo is Tokyo University of Agriculture and Technology, another national university where a number of polymer scientists are active. This university has a history of nearly one hundred years and is the successor of Komaba Agriculture School. It consists of three faculties: Faculty of General Education, Faculty of Technology, and Faculty of Agriculture. The Faculty of Technology has its origin from a technical college which had been established as an independent school over fifty years ago for the purpose of developing research on natural fibers, especially silk.

Faculty of Technology

Department of Textile and Polymer Science: Professor Kiichiro Sakaoku and Instructor Takashi Itoh are investigating structure and physical properties of synthetic and biological polymers, including poly(vinylidene fluoride), collagen, and fibrinogen. Professor Haruo Sanuki is interested in the treatment of fibers to improve their physical and chemical properties characteristic for the textile surface such as flammability and wettability. Instructor Kazuhiko Ikeda in this group is studying the mechanism of α -chymotrypsin-catalyzed hydrolysis. Associate Professor Yasuyuki Tanaka and Instructor Hisaya Sato, who came from industry some years ago, are investigating the microstructure of synthetic rubber. Associate Professor Zenzo Morita and Instructor Hiromi Motomura are carrying out research on physical chemistry of dyeing and washing of polymers with emphasis on the diffusion of low molecular weight

substances, and the adsorption and binding of dyes on polymers. Associate Professor Seizo Miyata is studying mechanical and electrical properties of bulk polymers especially the piezoelectricity of poly(vinylidene fluoride). Associate Professor Toshihiro Akaike, who joined the university recently from Tokyo Women's Medical College, is studying the interaction between synthetic polymers and living systems to develop biomedically useful polymers and Associate Professor Shigeki Mitaka, the mechanical properties of biological and synthetic membranes.

Department of Industrial Chemistry: Professor Yasuo Ohno is interested in the synthesis and characterization of polysaccharides and related biopolymers. His group, including Instructor Toskihiko Sato, is also studying chemical and biological modification of cellulose. Professor Rokuro Kaneko is investigating polymer blends and adhesives and thermal properties of polymers. Instructor Chozo Hirao in this group is concerned with the structural change of silk fibroin during an enzymatic hydrolysis. Professor Kenzo Nishida is studying the interaction of watersoluble polymers with dyes and with anticancer drugs. Instructor Yutaka Ando of this group also studies electro-mechanical properties of polymers. Associate Professor Mitsuaki Narita and Instructor Shizuko Isokawa are conducting research on the synthesis and properties of polypeptides and proteins. Associate Professor Masayasu Akiyama is working on the synthesis of enzyme models and the functions of N-hydroxy peptides.

Department of Filature Technology: Professor Aio Kitamura is investigating viscoelastic properties of silk proteins and Professor Osamu Fukumoto is studying polycondensation, photopolymerization, and polymer composites. Associate Professor Kiyoshi Hirabayashi is studying the structure and properties of silk and related materials and Associate Professor Fukuji Higashi uses phosphorus compounds in polycondensation reactions.



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Department of Chemical Engineering: Associate Professor Shinzo Omi is working on polymerization-reaction engineering and developing a microencapsulation technique with synthetic polymers as the encapsulation materials.

Department of Electronic Engineering: Associate Professor Hiroyuki Sasabe, in collaboration with Instructor Koichi Kamisako, is carrying out research on photoconductive and photodielectric properties of polymers, the electrical conduction mechanism in polymeric materials, and molecular relaxation processes in polymers.

Faculty of General Education

Laboratory of Physics: Professor Yoshiaki Chikahisa, a theoretician, is concerned with various physical properties of polymers, for example, excluded volume, entanglement, viscosity, and viscoelasticity. Associate Professor Haruhiko Nakajima is engaged in studies of viscoelastic properties of polymer solutions (also on biological materials) using ultrasonic techniques.

Laboratory of Chemistry: Associate Professor Saburo Akiyama is studying the compatibility of polymers, and phase diagrams of polymer blends.

Tokyo Metropolitan University

This university was founded soon after World War II (1949) by the city of Tokyo. It is located about 2 km from the Tokyo Institute of Technology. Tokyo Metropolitan University has two faculties, Science and Engineering, each of which has five departments. The university is best known in polymer physics from the pioneering work of Professor Emeritus Shoten Oka.

Faculty of Science

Professor Tsuneo Seto, a crystallographer, found a monoclinic modification of the polyethylene crystal and is now studying polymorphism under a high pressure. Associate Professor Masao Doi, a theoretical polymer physicist, is continuing to work on the Doi-Edwards Theory for concentrated solutions.

Faculty of Engineering

Professor Yasuji Kobayashi and his group are working on infrared dichroism and birefringence of oriented polymer samples in relation to their fine structures in both the crystalline and amorphous region and on dynamic mechanical properties of polymers.

Kogakuin University

Kogakuin University is a private school; it is more than 90 years old and has two separate campuses; Shinjuku, outside of the Yamanote line, and another in Hachioji City, about 50 km west of the center of Tokyo. The university places its main emphasis on engineering and current technology.

Shinjuku Campus

Professors Yukisaburo Yamaguchi and Yasushi Oyanagi are investigating moldability of polymers in

relation to the molding process. Professor Rinjiro Kawai specializes in the surface chemistry of polymers and Professor Masaaki Yokoyama is working on syntheses and characterization of phosphorus-containing polymers of high thermal stability.

Hachioji Campus

Professor Ken Ibonai is studying polymer modification and molding processes. Associate Professor Shinya Teramachi is interested in the characterization of copolymers in an effort to establish the composition-molecular weight relationship.

Tokyo Women's Christian University

Seikei University

International Christian University

Between the center of Tokyo and Hachioji City are located Tokyo Women's Christian University (TWCU), Seikei University (SU), and International Christian University (ICU), each of which has polymer research groups. Professor Mikiko Shima's group in TWCU has been studying dilute solution properties of block copolymers. In SU, Professor Yoshio Iwakura, after his retirement from the University of Tokyo some years ago, not only is continuing the investigation of new polymers by polycondensation and polyaddition, but also, in cooperation with Dr. Keisuke Kurita, is studying soluble chitin derivatives. Professor Iwakura has served as the President of the Society of Polymer Science, Japan, for two terms. Professor Akira Miyake in the Department of Physics, ICU, has been engaged in the theory of statistical mechanics of polymer chains, including stiff-chain molecules and is now applying the scaling concepts in polymer physics.

Hoshi College of Pharmacy

Professor Koji Nagai has been studying the drug delivery systems and is one of the few pharmacists who is active in polymer chemistry.

Kanagawa Prefecture

Yokohama, about 30 km south of Tokyo, is the third largest city in Japan. Of the universities in Yokohama, Keio University and Yokohama National University have active research groups in polymer science and engineering.

Keio University

Keio University is a private school and was established more than 120 years ago. The Faculty of Engineering is located in the area close to metropolitan Yokohama. Two groups in this faculty are engaged in polymer research.

Professor Yasuji Ohtsuka in the Department of Applied Chemistry is investigating light-focusing devices, rod lens, and optical fibers made out of synthetic poly-



Department of Technology, Kelo University

mers. He has developed, in cooperation with Instructor Toshiko Sugano, new methods of preparing these articles and a technique of measuring their optical properties. Professor Ohtsuka and Associate Professor Haruma Kawaguchi are involved in emulsion polymerization, preparation and application of characteristic polymer latices. Professor Ohtsuka and Instructor Yoshiaki Hirabayashi have been investigating membranes with selective permeability. Professor Ohtsuka is also interested in modification of polymer surfaces.

Professor Teikichi Arai of the Department of Mechanical Engineering is leading another research group in polymer science with major interest in material science and the rheology of polymer processing. He has maintained a broad interest in fluid dynamics, solid mechanics, molecular theories, and stress analysis of the flowing viscoelastic polymer melts by flow birefringence method.

Yokohama National University

The university was established when the new education system was introduced in 1949. It is located on a hill in a suburb of Yokohama.

Professor Hiroshi Kakiuchi in the Department of Applied Chemistry is working on three-dimensional resin particularly syntheses and properties of new epoxy resins. In cooperation with Instructor Takao Iijima, he has studied the ring-opening reaction and polymerization of epoxides and thiranes. Associate Professor Wakichi Fukuda is working on radical cyclopolymerization of divinyl compounds, especially on vinyl and allyl itaconates and the selective transport of alkali ions through copolymer membranes with crown ether units. Investigation of the catalytic effect of polymer-supported onium salts and polymeric strong bases is also carried out by Professor Kakiuchi and Lecturer Masao Tomoi.

Chiba Prefecture

Chiba University

Chiba University is a national university in Chiba prefecture and is located about 50 km east of the center of Tokyo, close to Narita International Airport. Polymer

chemistry in this university is being studied by six research groups, three groups of which are in the Department of Image Science and Engineering.

Professor Kuniharu Kojima's research group is in the Department of Engineering Chemistry. The research projects of his group, which includes Associate Professor Susumu Iwabuchi and Instructor Takayuki Nakahira, are: polymeric sensitizers, redox polymers, and graft copolymerization initiated by organometallic compounds. Professor Kuniharu Nagakubo in the Department of Synthetic Chemistry with Associate Professor Masatoshi Miura and Instructor Fumihiko Akutsu are studying: syntheses of heat resistant polymers and the effect of the polymer structure on the catalytic activity of supported transition metal complex catalysts.

Professor Yasushi Hishiki and Associate Professor Ryo Hirohashi in the Department of Image Science and Engineering are studying the photoconductivity of semi-conducting polymeric materials and sensitizing dyes for semiconductors. In order to relate the photo and electrical conductivities of polymers with the molecular structure, polymers carrying sensitizing dyes and charge transfer complexes were synthesized. They also investigated the molecular design of organic photoreceptors for the electrophotography. Professor Takahiro Tsunoda in the same department is studying photochemistry of polymeric materials. His group, which includes Associate Professor Tsuguo Yamaoka and Instructor Kenichi Koseki, works on the mechanism for the photocrosslinking reaction of 1,2-polybutadiene with aromatic azide. Associate Professor Kazuyuki Sugita and Instructor Nobuo Ueno, are investigating the utilization of polymeric substances as imaging materials, including resist polymers for microfabrication and photosensitive ionomers. A quite simple drying method was developed to form a resist pattern which consists of the application of an image irradiation on a positive resist with ultraviolet light to cause degradation and successive evaporation of the resist polymer. Associate Professor Minoru Tsuda and Instructor Setsuko Oikawa in the Faculty of Pharmaceutical Sciences are carrying out investigations on resist materials for electron-beam, x-rays and UV lithographies, which are required for the manufacturing of the VLSI. Quantum chemical investigations provide the theoretical basis for the Millar-Wall-Charlesby empirical rule for the radiation effects on polymers, and give an explanation for the anomalous behavior of polytetrafluoroethylene.