

LABORATORY OF FIBER CHEMISTRY

Head: Dr. Ryoza Kitamaru

This laboratory was established in 1958, separating from Sakurada Laboratory. Sakurada Laboratory terminated in March 1967 by the retirement of the laboratory head, Dr. Ichiro Sakurada. The informations of the present and Sakurada Laboratories before 1966 were already field in No. 6, Vol. 44 of this bulletin. The research head of this laboratory had been Dr. Waichiro Tsuji until his retirement in March 1974, succeeded by the present research head.

The research field of this laboratory has covered the studies of the crystallization and phase structure of crystalline polymers, the chemical reactions of polymers, and the development of new polymer products.

Publications

(* indicates an article published in Japanese)

I. Phase Structure and Properties of Polymers

1. W. Tsuji, R. Kitamura, and F. Sakaguchi: Studies on the Molecular Structure and Physical Properties of Crystalline Polystyrene (I). Crystallinity of Isotactic Polystyrene, *Kobunshi Kagaku (Chem. High Polymers, Japan)*, **23**, 836 (1966).*
2. *ditto*, (II). Effects of Stereoregularity and Molecular Orientation on the Physical Properties of Isotactic Polystyrene, *Sen-i Gakkaishi (J. Soc. Fiber Sci. Tech. Japan)*, **23**, 18 (1967).*
3. *ditto*, (III). Mechanical Properties of Copolymers of Styrene with α -Olefins, *J. Soc. Fiber Sci. Tech., Japan*, **23**, 25 (1967).*
4. F. Sakaguchi, R. Kitamaru, and W. Tsuji: Crystallization of Stereospecific Olefin Copolymers, *Bull. Inst. Chem. Res., Kyoto Univ.*, **44**, 295 (1966).
5. W. Tsuji, F. Sakaguchi, R. Kitamaru, and K. Hirabayashi: The Crystalline Structure of Ethylene-Butene-1 Copolymers, *ibid.*, **45**, 112 (1967).
6. F. Sakaguchi, W. Tsuji, and R. Kitamaru: Dynamic Mechanical Properties of Poly (4-methyl-1-pentene) Fractions, *Kobunshi Kagaku (Chem. High Polymers, Japan)*, **24**, 318 (1967).*
7. W. Tsuji, R. Kitamaru, and F. Sakaguchi: Structure and Properties of Some Crystalline Olefin Copolymers, *Annual Rep. Inst. Chemical Fibers, Kyoto Univ.*, **24**, 15 (1967).*
8. F. Sakaguchi, W. Tsuji, T. Yamazaki, T. Kitao, and S. Ōya: Crystalline Transformations and Mechanical Properties of Polyolefin Fibers. (I). Properties of Polybutene-1 and Its Copolymers, *Sen-i Gakkaishi (J. Soc. Fiber Sci. Tech., Japan)*, **23**, 254 (1967).*
9. F. Sakaguchi and W. Tsuji: *ditto*, (II). Properties of Polypropylene-1 and Its Copolymer with 3-Methyl-1-Butene, *J. Soc. Fiber Sci. Tech., Japan*, **23**, 306 (1967).*
10. F. Sakaguchi, W. Tsuji, and R. Kitamaru: Crystallization of Copolymers of 3-Methyl-1-butene with Olefins Produced by Ziegler-Natta Catalysts, *Kobunshi Kagaku (Chem. High Polymers, Japan)*, **24**, 493 (1967).*
11. W. Tsuji and H. Chu: Mechanical Properties of Polypropylene Styrene Graft Copolymer, *Sen-i Gakkaishi (J. Soc. Fiber Sci. Tech., Japan)*, **23**, 145 (1967).*
12. H. Chu, R. Kitamaru, and W. Tsuji: Dynamic Viscoelastic Properties of Isothermally Crystallized Polypropylene Fractions, *Kobunshi Kagaku (Chem. High Polymers, Japan)*, **25**, 467 (1968).*
13. R. Kitamaru, H. Chu, and W. Tsuji: The Crystalline Structure of a Slightly Crosslinked Polyethylene Crystallized in the Stretched State, *Polymer Letters*, **5**, 257 (1967).

14. H. Chu, R. Kitamaru, and W. Tsuji: Some Structures and Properties of Very High Molecular Weight Linear Polyethylene, *Bull. Inst. Chem. Res., Kyoto Univ.*, **47**, 209 (1969).
15. S.-H. Hyon, H. Taniuchi, and R. Kitamaru: The Orientation of Crystal Planes in Polyethylene Crystallized under Compression, *ibid.*, **51**, 91 (1973).
16. R. Kitamaru, H.-D. Chu, and S.-H. Hyon: The Properties of Transparent Film Made from Linear Polyethylene by Irradiation Cross-Linking, *Macromolecules*, **6**, 337 (1973).
17. R. Kitamaru, H.-D. Chu, and W. Tsuji: The Properties and Structure of Transparent Crystalline Polyethylene, *Annual Rep. Inst. Chemical Fibers, Kyoto Univ.*, **30**, 43 (1973).*
18. R. Kitamaru and S.-H. Hyon: Size and Orientation of Crystallites in Lightly Cross-Linked Polyethylene, Crystallized from the Melt under Uniaxial Compression, *Makromolekulare Chemie*, **175**, 255 (1974).
19. S.-H. Hyon, R. Kitamaru, H. Taniuchi, N. Tamura, and N. Hayakawa: Broad-Line NMR Studies of Molecular Motion in Lightly Cross-Linked Polyethylene, Crystallized from the Melt under Uniaxial Compression, *Kobunshi Ronbunshu*, **32**, 240 (1975).*
20. S.-H. Hyon and R. Kitamaru: Orientation of Crystallites in Lightly Cross-Linked Isotactic Polypropylene, Crystallized from the Melt under Uniaxial Compression, *J. Polym. Sci. Polymer Physics Edition*, **13**, 1085 (1975).
21. R. Kitamaru, F. Horii, and S.-H. Hyon: Studies on the Phase Structure of Linear Polyethylene by Broad-Line NMR Spectrometry, submitted to *J. Polym. Sci., Polymer Physics Edition*.
22. F. Horii and R. Kitamaru: Proton Magnetic Spectrum of Linear Polyethylene at the Melt, *J. Polym. Sci., Letter Edition*, in press.

II. Chemical Modification of Fibers

1. W. Tsuji, T. Ikeda, and Y. Kadono: Chemical Treatment of Cotton by the Graft Copolymerization of Reactive Monomer and Cross-linking. (II) Glycidyl Methacrylate, *Sen-i Gakkaishi (J. Soc. Fiber Sci. Tech., Japan)*, **22**, 504 (1966).*
2. W. Tsuji, T. Ikeda, M. Umatani, and Y. Kadono: Chemical Modification of Fibers by the Graft Copolymerization of Reactive Monomers. (I) Graft Copolymerization of Acrylamide and Glycidyl Methacrylate onto Cotton Fabric and Crosslinking of the Graft Copolymers, *Bull. Inst. Chem. Res., Kyoto Univ.*, **45**, 77 (1967).
3. W. Tsuji, T. Ikeda, and Y. Kurokawa: *ditto*. (II). Graft Copolymerization of Acrylic Acid onto Polypropylene and Polyvinyl Chloride Fibers, *ibid.*, **45**, 87 (1967).
4. W. Tsuji, T. Ikeda, Y. Kurokawa, and N. Nakatani: Modification of Synthetic Fiber by the Graft Copolymerization of Reactive Monomer. (I) Graft Copolymerization of Acrylic Acid onto Polypropylene Fiber, *Sen-i Gakkaishi (J. Soc. Fiber Sci. Tech., Japan)*, **23**, 327 (1967).*
5. W. Tsuji, T. Ikeda, and Y. Kurokawa: *ditto*. (II) Graft Copolymerization of Acrylic Acid onto Polyvinyl Chloride Fiber, *Sen-i Gakkaishi (J. Soc. Fiber Sci. Tech., Japan)*, **23**, 335 (1967).*
6. T. Ikeda, M. Hamanaka, and W. Tsuji: Graft Copolymerization of Acrylamide onto Co 60 γ -ray Preirradiated Cotton Fabrics in Aqueous Dioxane and Some Textile Properties of the Grafted Cotton Fabrics, *ibid.*, **25**, 447 (1969).*
7. T. Ikeda: The 200-Curie Cobalt-60 Gamma-Ray Irradiation Facility for Textile and Polymer Studies, *Bull. Inst. Chem. Res., Kyoto Univ.*, **48**, 45 (1970).
8. W. Tsuji: Study on the Lowering of the Tensile Strength of Cotton Caused by the Intermolecular Crosslinking, *Annual Rep. Inst. Chem. Fibers, Kyoto Univ.*, **27**, 39 (1970). *; *Bull. Inst. Chem. Res., Kyoto Univ.*, **49**, 69 (1971).
9. W. Tsuji, T. Ikeda, M. Hamanaka, and Y. Ikeda: Properties of Acrylic Acid Grafted Polypropylene Fiber, *Bull. Inst. Chem. Res., Kyoto Univ.*, **50**, 83 (1972); *Lenzinger Berichte*, **32**, 106 (Dez. 1971).
10. T. Ikeda, M. Hamanaka, W. Tsuji, and Y. Ikeda: Some Textile Properties of Acrylic Acid Grafted Polypropylene Fabric Treated with Metallic Salts under Various Conditions, *Sen-i Gakkaishi (J. Soc. Fiber Sci. Tech., Japan)*, **28**, 449 (1972).*
11. T. Ikeda, M. Hamanaka, W. Tsuji, and Y. Ikeda: Effect of Zinc Fluoroborate Catalyst on Thermo-oxidative Stability of Acrylic Acid Grafted Polypropylene Fabrics Treated with Tris (1-aziridinyl) phosphine oxide, *ibid.*, **29**, T-112 (1973).*
12. T. Ikeda, M. Hamanaka, W. Tsuji, and Y. Ikeda: Light Resistance of Acrylic Acid Grafted Polypropylene or Nylon 6 Fabrics, *ibid.*, **29**, T-186 (1973).*

13. T. Ikeda, W. Tsuji, and Y. Ikeda: Thermo-oxidative Stability of Acrylic Acid Grafted Nylon 6 Fabrics, *ibid.*, **29**, T-238 (1973).*
14. T. Ikeda, W. Tsuji, and Y. Ikeda: Thermal Analysis of Acrylic Acid Grafted Polypropylene Fabric. (I) Differential Scanning Calorimetry, *ibid.*, T-243 (1973).*
15. T. Ikeda, W. Tsuji, and Y. Ikeda: Thermal Analysis of Acrylic Acid Grafted Polypropylene Fabrics. (II) Thermogravimetry, *ibid.*, **29**, T-267 (1973).*
16. T. Ikeda, M. Hamanaka, Y. Ikeda, and W. Tsuji: Dynamic Properties of Acrylic Acid Grafted Polypropylene, *ibid.*, **29**, T-330 (1973).*
17. T. Ikeda, Y. Ikeda, S. Ito, and W. Tsuji: Improvement of Crease Resistance of Cotton Fabric by the Grafting with Acrylic Acid and Aftertreatment with Tris (1-aziridinyl) phosphine Oxide, *ibid.*, **30**, T-292 (1974).*
18. R. Fujimoto, N. Wakazaki, M. Hosono, and W. Tsuji: Carboxymethylation of Cotton Fabrics by One Step Method, *ibid.*, **30**, T-273 (1974).*
19. R. Fujimoto and W. Tsuji: Carboxymethylation of Cotton Fabrics by Glycolic Acid, *ibid.*, **30**, T-280 (1974).*
20. W. Tsuji, A. Hirai, and M. Hosono: Highly Accessible or Decrystallized Cotton by Chemical Methods, *J. Appl. Polym. Sci.*, **20**, (1976), in press.
21. A. Hirai, W. Tsuji, R. Kitamaru, and M. Hosono: Structure of Decrystallized Cotton in Fabrics Prepared by Alkali and Acrylonitrile Treatments, *ibid.*, **20**, (1976), in press.

III. New Polymer Products

1. H.-D. Chu and R. Kitamaru: Preparation and Physico-Chemical Properties of Highly Transparent and High Density Polyethylene Film from a Lightly Crosslinked Polyethylene, *Kobunshi Kagaku*, **29**, 214 (1972).
2. R. Kitamaru, C. Tsuchiya, and S.-H. Hyon: The Preparation of a New Type of Synthetic Fiber from Linear Polyethylene by Irradiation Cross-Linking, *Bull. Inst. Chem. Res., Kyoto Univ.*, **52**, 436 (1974).
3. S.-H. Hyon, H.-D. Chu, and R. Kitamaru: Structure and Physico-Chemical Properties of Polyvinyl Alcohol, Stretched at the Amorphous State and Annealed, *ibid.*, **53**, 367 (1975).
4. M. Hosono, O. Kusudo, S. Sugii, and W. Tsuji: Ionic Bonding between Sulfated and Amino Acetalized Derivatives of Polyvinyl Alcohol, *ibid.*, **52**, 442 (1974).
5. M. Hosono, S. Sugii, O. Kusudo, and W. Tsuji: Ionic Bonding between Acetalized Polyvinyl Alcohol with Diethoxyethyltrimethylammonium and Sulfated Polyvinyl Alcohol, *Kobunshi Ronbunshu*, **33**, 509 (1976).*
6. M. Hosono, S. Sugii, R. Kitamaru, Y.-M. Hong, and W. Tsuji: Polyelectrolyte Complex Prepared from Carboxymethylated and Aminoacetalized Derivatives of Polyvinyl Alcohol, *J. Appl. Polym. Sci.*, (1976), in press.

IV. Miscellaneous

1. M. Hosono, S. Sugii, O. Kusudo, and W. Tsuji: Simultaneous Estimation of Particle Size, Relative Refractive Index and Concentration of Latices by Turbidity Measurements, *Bull. Inst. Chem. Res., Kyoto Univ.*, **51**, 104 (1973).