

Thein Kyu

Department of Polymer Engineering
The University of Akron, Akron, OH 44325-0301
Tel (330) 972-6672; Fax (330) 258-2339
e-mail: tkyu@uakron.edu

Education

- 1969 - 1972 Department of Textile Engineering, Kyoto Institute of Technology, Kyoto 606, Japan, B. S.
- 1972 - 1974 Department of Polymer Chemistry, Faculty of Engineering, Kyoto University, Kyoto 606, Japan, M. S.
- 1974 - 1980 Department of Polymer Chemistry, Faculty of Engineering, Kyoto University, Kyoto 606, Japan, Ph. D.

Employment

- 1980 - 1981 Post-Doctoral Fellow, Department of Chemistry, McGill University, Montreal, Quebec H3A 2K6, Canada.
- 1981 - 1983 Research Associate, Polymer Research Institute, University of Massachusetts, Amherst, MA 01003.
- 1983 - 1987 Assistant Professor, Department of Polymer Engineering, The University of Akron, Akron, OH 44325.
- 1987 - 1991 Associate Professor, Department of Polymer Engineering, The University of Akron, Akron, OH 44325.
Tenure awarded in 1987.
- 1991 - 2006 Professor, Department of Polymer Engineering, The University of Akron, Akron, OH 44325.
- 2006 - Present Distinguished Professor, Department of Polymer Engineering, The University of Akron, Akron, OH 44325.

Professional

Books

1. "Liquid Crystalline Polymer Systems: Tech. Advances," A.I. Isayev, T. Kyu, and S.Z.D. Cheng Eds.,

Papers and Book Chapters

1. T. Kyu, M. Tabushi, S. Nomura and H. Kawai, "Dynamic Birefringence Behavior of Semicrystalline Polymers. I. Principles and Experimental Procedures of the π -sector Technique," *Polym. J.*, 7, 108 (1975).
2. " T. Kyu, N. Yasuda, S. Suehiro, S. Nomura and H. Kawai, Dynamic Birefringence Behavior of Semicrystalline Polymers. II. The Crystalline Relaxation Mechanisms of Low- and Medium-Density Polyethylene," *Polym. J.*, 8, 56 (1976).
3. S. Suehiro, T. Yamada, H. Inagaki, T. Kyu, S. Nomura and H. Kawai, "Rheo-Optical Studies on the Deformation Mechanism of Semicrystalline polymers. IV. On the Nature of α Mechanical Dispersion of Low-Density Polyethylene in Relation to the Mechanism of Spherulite Deformation," *J. Polym. Sci., Polym. Phys. Ed.*, 17, 763 (1979).
4. S. Suehiro, T. Kyu, K. Fujita and H. Kawai, "Rheo-Optical Studies on the Deformation Mechanism of Semicrystalline Polymers. V. Quantitative Analysis of Grain-Boundary Relaxation Phenomenon," *Polym. J.*, 11, (1979).
5. S. Suehiro, T. Yamada, T. Kyu, K. Fujita, T. Hashimoto and H. Kawai, "Rheo-Optical Studies on the Deformation Mechanism of Semicrystalline Polymers. VIII. Dynamic X-ray Diffraction of a High-Density Polyethylene Having Row-Nucleated Crystalline Texture of C-axis Orientation," *Polym. Eng. Sci.*, 19, 929 (1979).
6. T. Kyu, N. Yasuda, S. Suehiro, T. Hashimoto and H. Kawai, "Rheo-Optical Studies on the Deformation Mechanism of Semicrystalline Polymers. IX. Dynamic Birefringence Behavior of a High-Density Polyethylene Having Row-Nucleated Crystalline Texture of C-axis Orientation," *Polymer*, 21, 1205 (1980).
7. T. Kyu, S. Suehiro, S. Nomura and H. Kawai, "Rheo-Optical Studies on the Deformation Mechanism of Semicrystalline Polymers. X. The Orientation Retardation Spectrum of Polyethylene," *J. Polym. Sci. Polym. Phys. Ed.* 18, 951 (1980).
8. T. Kyu, S. Suehiro and H. Kawai, "Rheo-Optical Studies on the Deformation Mechanism of Semicrystalline Polymers. XI. Mechanical and Optical Retardation Spectra of High-Density Polyethylene Having Row-Nucleated Crystalline Texture of C-axis Orientation," *Polym. J.*, 12, 251 (1980).
9. T. Kyu, M. Yamada, S. Suehiro and H. Kawai, "Rheo-Optical Studies on the Deformation Mechanism of Semicrystalline Polymers. XII. On the Nature of Alpha and Beta Mechanical Dispersion High-Density Polyethylene in Relation to Mechanism of Spherulite Deformation," *Polym. J.*, 12, 809 (1980).
10. H. Kawai, T. Hashimoto, S. Suehiro, and T. Kyu, "Rheo-Optical Studies on the Nature of Alpha and Beta Mechanical Dispersions of Polyethylene in Relation to the Deformation Mechanisms of Spherulitic Crystalline Texture," *Rheology Applications*"; Vol. 3, Ed. by G. Astarita, Plenum Press N.Y., pp. 409-414, 1980.
11. R.J. Cembrola, T. Kyu, S. Suehiro, H. Kawai and R.S. Stein, "Dynamic Birefringence Studies of High-Density Polyethylene," *J. Polym. Sci., Polym. Phys. Ed.* 20, 1279 (1982).
12. T. Kyu and A. Eisenberg, "Mechanical Relaxations in Nafion Perfluorinate Ionomeric Membranes," *"Perfluorinated Ionomer Membranes," ACS Symp. Series #180*, A. Eisenberg and H.L. Yeager Eds., Washington, D.C., Ch.6, p. 79, 1982.
13. R.J. Cembrola, T. Kyu, R.S. Stein, S. Suehiro and H. Kawai, "Dynamic X-ray Diffraction Studies of High-Density Polyethylene," *J. Polym. Sci., Polym. Phys. Ed.*, 21, 329 (1983).
14. T. Kyu, M. Hashiyama and A. Eisenberg, "Dynamic Mechanical Studies of Partially Ionized and Neutralized Nafion Polymers," *Can. J. Chem.*, 61, 680 (1983).
15. T. Kyu and A. Eisenberg, "Electro-rheological Effect on Ionomer Membranes. I. The Nafion Polymers," *J. Polym. Sci., Polym. Lett. Ed.*, 21, 589 (1983).

59. P. Young, R.S. Stein, T. Kyu and J.S. Lin, "Sta

100. T. Kyu, I. Ilies, C. Shen, and Z.L. Zhou "Phase Behavior and Phase Separation Dynamics in a Mixture of Functional Polymethyl Methacrylate and Monomeric Liquid Crystal," in "*Liquid Crystalline Polymer Systems: Tech. Advances*," A.I. Isayev, T. Kyu, and S.Z.D. Cheng Eds., *A.C.S. Symp. Ser.* # 632, Washington D.C., Ch. 13, p 201 (1996).
101. H.-W. Chiu, Z.L. Zhou, T. Kyu, L. G. Cada and L.C. Chien, "Phase Behavior of a Mixture of Side-Group Liquid Crystalline Polymer and Main-Chain Monomeric Liquid Crystal," *Macromolecules*, 29, 1051 (1996).
102. K. Fujita, T. Kyu, and R. St. J. Manley, "Miscibility and Phase Separation Behavior of Two Crystalline Polymer Blends: III. Liquid-Liquid Phase Separation in Blends of Polyvinylidene Flouride and Polybutylene Adipate," *Macromolecules*, 29, 91 (1996).
103. T. Kyu, C. Shen, and H.-W. Chiu, "Effect of Molecular Weight on Miscibility Phase Diagrams of Polymer/Liquid Crystal Mixtures," *Mol. Cryst. Liq. Cryst.*, 287, 27 (1996).
104. Z.L. Zhou, G. Zhu, T. Kyu, Y. Tajuddin and S. Qutubuddin, "Novel Filled Composites Prepared from In-situ Polymerization via a Colloidal Approach: I. Nylon 6/Kaolin In-situ Composites," *J. Polym. Sci. B: Polym. Phys.*, 34, 1761 (1996).
105. T. Kyu, G. Zhu, Z.L. Zhou, Y. Tajuddin and S. Qutubuddin, "Novel Filled Composites Prepared from In-situ Polymerization via a Colloidal Approach: II. Blends of Nylon 6/Kaolin In-situ Composites with Polyamides," *J. Polym. Sci. B: Polym. Phys.*, 34, 1769 (1996).
106. T. Kyu and H.-W. Chiu, "Phase Equilibria of a Polymer and Smectic Liquid Crystal Mixture," *Phys. Rev. E*, 53, 3618 (1996).
107. T. Kyu and J.H. Lee, "Nucleation Initiated Spinodal Decomposition in a Polymerizing System," *Phys. Rev. Lett.*, 76, 3746 (1996).
108. M.C. Chang, H.-W. Chiu, T. Kyu, N. Leroux, and L.C. Chien, "Miscibility Phase Diagrams of the Mixtures of Side-on Side Chain Liquid Crystalline Polymers and Low Molar mass Liquid Crystals," *Mol. Cryst. Liq. Cryst.*, 299, 253-258 (1997).
109. D. Nwabunma, Z.L. Zhou, and T. Kyu, "Development of Non-birefringent Optical Adhesives," *Mol. Cryst. Liq. Cryst.*, 301, 301-305 (1997).
110. T. Kyu, H.-W. Chiu and T. Kajiyama, "Induced Smectic Phase in a Nematic Liquid Crystal Mixture," *Phys. Rev. E*, 55, 7105 (1997).
111. D. Nwabunma, Z.L. Zhou and T. Kyu, "Optical Adhesives Based on Blends of Methyl Methacrylate -co- Diglycidyl Ether Copolymer and Bisphenol-A Epoxy," *J. Polym. Sci.: B Polym. Phys.*, 35, 1911 (1997).
112. C.Y. Chen, W.Md.Z.W. Yunus, H.-W. Chiu, and T. Kyu, "Phase Separation Behavior in Blends of Isotactic Polypropylene/Ethylene-Propylene Diene Terpolymer," *Polymer*, 38, 4433 (1997).
113. H.-W. Chiu and T. Kyu, "Phase Diagrams of a Binary Smectic Mixture," *J. Chem. Phys.*, 107, 6859 (1997).
114. X.Y. Wang, S.B. Fan, and T. Kyu, "An Exact and Complete Solution of a Class of Nonlinear Diffusion Equations and Velocity Selection," *Phys. Rev. E: Rapid Comm.*, 56, 4931 - 4934 (1997).
115. I. Isayeva, T. Kyu, and R. St. J. Manley, "Phase Transitions, Structure Evolution, and Mechanical Properties of Blends of Two Crystalline Polymers: Poly(vinylidene fluoride) and Poly(butylene adipate)," *Polymer*, 39, 4599-4608 (1998).
116. H.-W. Chiu and T. Kyu, "Phase Equilibria of a Nematic and Smectic Liquid Crystal Mixture," *J. Chem. Phys.*, 108, 3249-3255 (1998).
117. X.Y. Wang, J.-F. Li, E. Gurarie, S. Fan, T. Kyu, M.E. Neubert, S.S. Keast, and C. Rosenblatt, "Kinetics of Phase Transition in an Antiferroclinic Liquid Crystal Induced by a Uniform Temperature Field: Growth by Solitary Waves," *Phys. Rev. Lett.*, 80, 4478-4481 (1998).
118. M.-C. Chang, H.-W. Chiu, X.Y. Wang, T. Kyu, N. Leroux, S. Campbell, and L.C. Chien, "Phase Transitions in Blends of Side-on Side-Chain Liquid Crystalline Polymers and Low Molar Mass Liquid Crystals," *Liq. Cryst.*, 25, 733-744 (1998).

139. D. Nwabunma and T. Kyu, "Phase Behavior, Photopolymerization and Morphology Development

156. Y. Okabe and T. Kyu, "Spatio-temporal growth of broken spiral and concentric ringed spherulites in blends of poly(vinylidene fluoride) and ethylene-vinylacetate copolymers." *Polymer*, 45, 8485-8490 (2004).
157. J.H. Lee, G. Yandek, and T. Kyu, "Reaction induced phase separation in blends of epoxy and multifunctional polybutadiene" *Polymer*, 46, 12511-12522 (2005).
158. S. Meng, T. Kyu, L.V. Natarajan, V. P. Tondiglia, R.L. Sutherland, and T.J. Bunning, "Holographic photo-polymerization induced phase separation in reference to the phase diagram of a mixture of photo-curable monomer and nematic liquid crystal." *Macromolecules*, 38, 4844-4854 (2005).
159. G. Yandek and T. Kyu, "Theoretical Modeling of the Phase Separation Dynamics in Blends of Reactive Monomers", *Macro. Theo. Simul.*, 14, 312-324, (2005).
160. S. Meng, J. Xu, S.I. Kuchanov, and T. Kyu, "Collaborative Studies of Thermo-Oxidative Degradation of Styrene – Isoprene Diblock Copolymer" *Polymer*, 46, 5580-5587 (2005).
161. H. Xu, R. Matkar, T. Kyu, "Phase Field Modeling on Morphology Landscape of Isotactic Polystyrene Single Crystal" *Phys. Rev. E*, 72, 011804~ 13 (2005).
162. H. Duran, B. Gazdecki, A. Yamashita, and T. Kyu, "Effect of carbon nanotube on phase transitions of nematic liquid crystals", *Liq. Cryst.*, 32, 815-822 (2005).
163. C.I. Cano, E. Weiser, T. Kyu, and B. Pipes, "Polyimide Foams from Powder: Experimental Analysis of Competitive Diffusion Phenomena" *Polymer*, 46, 9296-9303 (2005).
164. H. Xu, W. Keawwattana, and T. Kyu, "Effect of Thermal Transport on Spatio-temporal Emergence of Lamellar Branching Morphology during Polymer Spherulitic Growth," *J. Chem. Phys.*, 123, 124908 (2005).
165. A.J. Guenthner, S. Khombhongse, W. Liu, P. Dayal, D.H. Reneker and T. Kyu, "Dynamics of Hollow Nanofiber Formation during Solidification Subjected to Solvent Evaporation," *Macromol. Theo. Simul.*, 15, 87-93 (2006).
166. T. Kyu, S. Meng, H. Duran, K. Najundiah, and G.R. Yandek, "Holographic Polymer Dispersed Liquid Crystals and Polymeric Photonic Crystals formed by Holographic Photolithography," *Macromol. Res.*, 14, 155-165 (2006).
167. G.R. Yandek, S. Meng, G.M. Sigalov, and T. Kyu, "Three-dimensional Switchable Photonic Crystals via Various Optical Wave Interference Techniques," *Liq. Cryst.*, 33, 775-788 (2006).
168. P. Dayal, R. Matkar, and T. Kyu, "Crystal – Liquid Crystal Phase Diagrams," *J. Chem. Phys.*, 124, 224902~6 (2006).
169. R.A. Matkar and T. Kyu, "Role of Crystal-Amorphous Interaction on Phase Equilibria of Crystal/Amorphous Polymer Blends," *J. Phys. Chem., B* 110, 12728-12732 (2006).
170. R.A. Matkar and T. Kyu, "Phase Diagrams of Binary Crystalline Polymer Blends," *J. Phys. Chem., B* 110, 16059-16064 (2006).
171. H. Xu, H.-W. Chiu, Y. Okabe, and T. Kyu, "Breakup of Spiral and Concentric Ringed Spherulites in Polymer Crystallization," *Phys. Rev. E*, 74, 011801~5 (2006).
172. P. Dayal and T. Kyu, "Porous Fiber Formation in a Polymer-Solvent System undergoing Solvent Evaporation," *J. Appl. Phys.*, 100, 043512~6 (2006).
173. D. Kim, T. Kyu, and T. Hashimoto, "Phase Equilibria and Phase Separation Dynamics in a Polymer Composite containing a Main-Chain Liquid Crystalline Polymer," *J. Polym. Sci. B: Polym. Phys.*, 44, 3621-3631 (2006).
174. P. Dayal, A.J. Guenthner, and T. Kyu, "Morphology Development in Main-Chain Liquid Crystalline Polymer Fibers during Solvent Evaporation," *J. Polym. Sci. B: Polym. Phys.*, 45, 429-435 (2007).
175. T. Kyu, R.A. Matkar, D.S. Lim, and C. Ko, "Discrepancy in determination of χ parameters by melting point depression versus small angle neutron scattering in blends of deuterated polycarbonate and isotactic poly(methyl methacrylate)" *J. Appl. Cryst.*, 40, 675-679 (2007).
176. C. Cano, M. Clark, T. Kyu, R. B. Pipes, "Modeling Particle Inflation from Poly(amic acid) Powdered Precursors (Part I): Preliminary Stages Leading to Bubble Growth" *Polym. Eng. Sci.*, 47

177. C. Cano, M. Clark, T. Kyu, R. B. Pipes, "Modeling Particle Inflation from Poly(amic acid) Powdered Precursors (Part II): Morphological Development During Bubble Growth" *Polym. Eng. Sci.*, 47, 572-581 (2007).
178. S. Meng, H. Duran, J. Hu, T. Kyu, L.V. Natarajan, V.P. Tondiglia, R.L. Sutherland, and T.J. Bunning, "Influence of photo-polymerization reaction kinetics on diffraction efficiency of H-PDLC undergoing pattern-photolithographic reaction in mixtures of acrylic monomer/nematic liquid crystals" *Macromolecules*, 40, 3190-3197 (2007).
179. S. Meng, H. Duran, and T. Kyu, "Influence of acrylate arm topology on phase diagrams of mixtures of multi-arm acrylate photo-curable monomers and nematic liquid crystals," *J. Phys. Chem.*, 111, 5115-5123 (2007).
180. S.J. Park, P. Rathi, and T. Kyu, "Photopolymerization Induced Directional Crystal Growth in Reactive Mixtures," *Phys. Rev. E*, 75, 051804/1-5 (2007).
181. P. Dayal, J. Liu, S. Kumar, and T. Kyu, "Experi252.66 671.94 Tm [(L.V.Ip7(m)8(e)2n(ta, and heoretL)6(icalInvesti

194. J. F. López, V. H. Orozco, L. D. Pérez, T. Kyu, and B. L. López “Effect of the Chemical Characteristics of Mesoporous Silica MCM-41 on Morphological, Thermal, and Rheological Properties,” *J. Appl. Polym. Sci.*, 111, 2229-2237 (2009). Kyu,153 Td [(ee)5i3262w 0 477 -0 T95(194.)TjEMC /P <