Introduction to Parts 5 and 6			
Part 5	Rheology and Processing of Polymers 5		
5.1	Rheology and Processing of Multiphase Systems 7 by L.A. Utracki 7		
	Abstract		
	Introduction		
	Newtonian Flows		
	Diluted Emulsions		
	Concentrated Systems 10		
	Polydispersity 10		
	Particle Shape Effect 11		
	Structure Formation		
	Deformability		
	Non-Newtonian Flows 14		
	Time-dependent Phenomena		
	Rate of Deformation 16		
	Elastic Effects		
	Extensional Flow 24		
	Specifity of Blend Behavior		
	Introduction		
	Miscible Blends		
	Immiscible Blends		
	A Shear-Induced Segregation		
	Dynamic Dispersion/Coalescence		
	The Shear-Induced Interlayer Slip		
	The Relation between Steady State, η , and Dynamic, η' , Viscosities . 34		
	Blend Elasticity		
	Elongational Flow		
	Composites with Anisometric Particles		
	Newtonian Viscosity		
	Yield Phenomena		
	Dynamic Testing		
	Extensional Flows 45		
	Orientation in Flow		
	Preparation and Processing of Multiphase Systems 47		
	Conclusions and Outlook 50		
	Nomenclature		
	References		
5.2	Rheological and Morphological Properties of Heterophase Block Copolymer		
	Solutions		
	by Tadao Kotaka and Hiroshi Watanabe		
	Abstract		
	Introduction		



.

t	Experimental Materials Materials Methods Methods Rheological Measurements Small-Angle X-Ray Scattering Small-Angle X-Ray Scattering Results and Discussion Styrene-Butadiene Diblock Copolymers in Selective Solvents Rheological Behavior Rheological Behavior	66 66 67 67 67 68 68 68
	Transition of Rheological Behavior	69 71 73 74 76
	Thermal Transition of the Macrolattice	78 79 80 80 81
	Thermally Induced Transition	82 84 85 85 85 85
	Conclusions and Future Direction Acknowledgements Nomenclature Symbols References	91 92 92 93 94
5.3	Nonlinear Viscoelasticity and Molecular Motion in Entangled Polymers. Effect of Molecular Weight Distribution	97
	Abstract Introduction The Tube Model and Nonlinearity The Tube Model and Nonlinearity Molecular Weight Distribution and Linear Viscoelasticity Materials and Method Materials and Method Results for Relaxation Modulus The Strain Dependence Discussion Acknowledgement Nomenclature References References	99 101 102 103 104 106 107 107
5.4	Viscoelastic Properties of Multi-Branched Polystyrenes	109
	Abstract Introduction Introduction Introduction Theoretical Background and Experimental Results for Small-Number	
	Branched Star Polymers	111

	Viscoelastic Properties of Multi-Branched Star Polystyrenes
	Experimental
	Frequency Dependence of Viscoelastic Functions
	Relaxation Spectrum
	Zero-Shear Viscosity
	Steady-State Compliance
	Reduced Molecular Weight and Branching Factors
	for Multi-Branched Star Polystyrenes
	Zero-Shear Viscosity
	Steady-State Compliance
	Concluding Remarks
	References
5.5	Property Modifications in Polystyrene Recovered from Solution
5.5	by H. P. Schreiber, A. Ajji, Yongming Li and A. Rudin
	Abstract
	Introduction
	Experimental
	Materials
	Network Modification
	Property Evaluations
	Results
	Stress-Strain Behavior
	Dynamic-Mechanical Behavior
	Thermal Scanning
	Melt Elasticity
	Speculation on Morphological States
	Acknowledgement 134 References 134
	References
5.6	Material Functions in Extension Using Arbitrary Deformation Programs 137
5.0	-
	by M. T. Shaw and F. B. Lin
	Abstract
	Introduction
	Importance of Extensional Flows
	Objective
	Experimental
	Materials and Conditions 140
	Thickness-controlled Rheometer
	Constant-rate Experiments
	Open-loop Experiments
	Third yold
	Open-loop Experiments
	Constant-Rate Experiments 144
	Concluding Remarks
	Acknowledgements
	Acknowledgements
	Nomenclature
	Acknowledgements

5.7	Modified Cole-Cole Plot as a Tool for Rheological Analysis of Polymers .			149
	by N. Nakajima and E. R. Harrell			
	Abstract			
	Introduction			
	Results	•		151
	Blends of Linear Narrow MWD Polystyrenes			
	Branched Polystyrene Having Narrow MWD	•		153
	Linear Polybutadiene Having Narrow MWD			
	Branched Polybutadiene Having Narrow MWD			
	Temperature Dependence of mCC and Long Branching			
	MWD of Linear High Density Polyethylene (HDPE)	•		156
	Butadiene-Acrylonitrile Copolymer Elastomer (NBR)			
	Chain-Scission and Branch-Formation During Processing			
	Solutions of Branched Polystyrene Having Narrow MWD			
	Oil Extending Elastomers			
	Morphology of Polyvinyl Chlorid (PVC)			
	Heat History on Viscoelastic Properties of PVC Compounds			
	Conclusion			
	Acknowledgements			
	Nomenclature			
	References	·	•••	165
5.8	Rheological Behavior of Elastomers Under Multiaxial Stress Field			167
	by Sueo Kawabata			
	Abstract			168
	Functional Form of W Function under Biaxial Stress Field	•	•••	170
	Viscoelasticity under Uni- and Biaxial Deformation	•	•••	175
	Triaxial Deformation	·	•••	175
	Concluding Remarks			
	Acknowledgement	·	•••	179
	References			
5.9	Nonlinear Viscoelastic Properties of Printing Inks	•	• •	181
	by Takeshi Amari and Koichiro Watanabe			
	Abstract			
	Introduction			
	Measurements of Viscoelastic Functions			
	Measurements of Dynamic Properties			183
	Measurement of Relaxation Modulus	•		185
	Strain Dependent Viscoelastic Properties			186
	Rate of Shear Dependent Viscoelastic Properties			190
	Shear Rate Dependence of G' and η'	•		190
	Shear Rate Dependent Relaxation Modulus			191
	Conclusions	•		194
	Acknowledgement			194
	Nomenclature	•		195
	References	•		195

Part 6	Multiphase Polymeric Systems
6.1	Structure Formation in Polymer Mixtures by Spinodal Decomposition 199 <i>by Takeji Hashimoto</i>
6.1	by Takeji Hashimoto Abstract 200 Introduction 200 Objectives 200 Objectives 200 Objectives 200 Demixing Mechanisms 201 Control of Intermediate Demixed Structures 203 Scope of Present Paper 203 Methods 203 Early Stage of Spinodal Decomposition and a Comment 204 Uniqueness in Studying Polymeric Systems 204 Uniqueness in Studying Polymeric Systems 204 Experimental Methods 205 Specimens 205 Time-Resolved Light Scattering Technique 205 Theoretical Background 208 General Aspects of Phase-Separation Kinetics 210 Molecular Parameters Characterizing Early Stage of SD 212 Reduced Variables and Characteristic Time 213 Demixed Structures in Solvent-Cast Films 214 "Structure Memory": Structure Developed in Solutions and its "Memory" in Bulk "Memory" in Bulk 216 Spinodal Decomposition of Ternary Solutions: 220
	Polymer A + Polymer B + Neutrally Good Solvent
	Scattering Behavior in the Nucleation and Growth Regime as Compared with that in the Spinodal-Decomposition Regime 228 Spinodal Decomposition of Binary Liquid Mixtures: PS/PVME 228 Comparisons of SD Behavior of the Binary System with That of the Ternary Systems
	Slow SD frocess from from genized Equilit writers in D2 + SDR * 235 Mechanical Mixing and "Homogenization"

6.2	Development of Modulated Structure in Polymer Blends	. 243
	Abstract	
	Modulated Structure in Solution Cast Films	244
	Casting Process	
	Kinetic Aspect of Phase Separation	247
	Mechanical Property of Blend with Modulated Structure	
	A Comment on Evaluation of Polymer-Polymer Miscibility	
	Acknowledgement	
	Symbols	
	References	
6.3	A Review of Miscibility Enhancement Via Ion-Ion and Ion-Dipole Interactions	. 255
	by Pierre Smith, Masanori Hara and Adi Eisenberg	
	Abstract	. 256
	Introduction	. 256
	Thermodynamic Considerations	. 257
	The Lower Critical Solution Temperature	. 257
	Methods of Studying Miscibility in Polymer Blends	. 257
	Scattering Methods	. 258
	Measurement of T_g	. 258
	Spectroscopic Techniques	. 259
	Comparison of Different Methods	. 239
	Effect of Interactions on the Properties of Polymers	. 260
	Intra/Inter-Molecular Interactions	. 200
	Hydrogen Bonding	. 200
		. 201
	Intermolecular Interactions	
	Hydrogen Bonding	. 201
	Charge Transfer	. 202
	Ionic Interactions Between Oppositely Charged Pendant Groups .	262
·	Previous Work in Miscibility Enhancement	262
	Physical Entanglements	263
	Covalent Bonds	. 263
	Hydrogen Bonding	. 263
	Charge Transfer	. 263
	Other Donor/Acceptor Type Interactions	. 263
	Ionic Interactions	. 264
	Other Ionic Interactions	. 264
	Experimental	. 265
	Materials	. 265
	Blending Techniques	. 266
	Sample Preparation	. 267
	Instrumental Methods of Analysis	. 267
	IR Spectroscopy	. 267
	DSC	. 268
	Dynamic Mechanical Measurements in the Transition Region	. 268
	Light Scattering	. 268

	Results and Discussion	. 268
	Ion-Ion Blends	. 268
	EA/S Blends	. 268
	IP/S Blends	. 273
	U/S Blends	. 275
	Ion-Dipole Blends	. 275
	T_g 's and Transparency of Blends	. 275
	Ionomer/PEO System	. 275
	Other Systems	. 276
	LCST Behavior of Ion-Dipole Blends	. 278
	Transparency Measurement for the S Ionomer/PPrO System	. 278
	Factors Affecting LCST Behavior	
	Conclusion	. 280
	References	. 281
6.4	Specific Interactions in Polymer Blends: FTIR and ¹³ C NMR Studies of Model	
	Compounds	. 285
	by Patrice Cousin, Robert E. Prud'homme and Andrew Garton	
	-	
	Abstract	
	Introduction	286
	Thermodynamics of Miscibility	286
	Specific Interactions	287
	Methods of Investigation	. 288
	A New Method: Competitive Equilibrium	289
	IR Spectroscopic Technique	
	NMR Spectroscopic Technique	. 291
	Results and Discussion	291
	Model Ester in α -Hydrogenated Chlorcarbon/Hydrocarbon Solvent	004
	Mixtures	. 291
	Model Ester in α -Hydrogenated/ β -Hydrogenated Chlorocarbon	202
	Solvent Mixtures	
	Concentration Dependence of Association Behavior	. 293
	Comparison of Polyester and Model Ester	294
	Scale of Interaction	
	A Special Case: Poly (Vinyl Bromide) Versus Poly (Vinyl Chloride)	
	Conclusions	
	References	
	References	. 271
6.5	Signal Receptive Capsule Membranes. Permeability Control of Capsule	
	Membranes Having Bilayer-Corkings or Surface-Grafted Polymers as a	200
	Permeation Valve	. 299
	by Yoshio Okahata	
	Abstract	. 300
	Introduction	. 300
	Experimental	. 301
	Preparation of Capsule Membranes	. 301
	Characterization of Capsule Membranes	. 302
	Permeation Measurements	. 303
	Results and Discussion	. 303

	Temperature-Sensitive Permeations	
	NaCl Permeations	303
	Large Molecule Permeations	306
	Photoresponsive Permeations	
	Ambient pH Responsive Permeations	
	Ca^{2+} -Sensitive Permeations	
	Electric Field Sensitive Permeations	
	Polymer-Grafted Capsule Membranes	
	Conclusion	
	References	
		, , ,
6.6	Permeation Properties of Polymer (Liquid Crystal) Composite Membrane 3	319
	by T. Kajiyama, H. Kikuchi, I. Terada, M. Katayose, A. Takahara and	
	S. Shinkai	
	Abstract	320
	Introduction	320
	Experimental	321
	Results and Discussion	
	Aggregation State of Polymer (Liquid Crystal) Composite Membrane 3	
	Preparation of Polymer (Liquid Crystal) Composite Ultrathin Film 3	
	Oxygen Enrichment Membrane Composed of a Polymer (Liquid	
	Crystal)/Fluorocarbon Ternary System	24
	Application of the Polymer (Liquid Crystal) Composite Membrane for	
	Molecular Filtration	25
	Facilitated and Active Transfer of Metal Cations Through a Polymer	125
	(Liquid Crystal) Composite Membrane	26
	Nomenclature	-
	References	51
6.7	Surface Modification of Polymer Solids by Graft Copolymers	333
	by Yasuhisa Tsukahara, Kenji Kohno and Yuya Yamashita	
	Abstract	334
	Introduction	
	Experimental	
	Materials	
	Preparation of St-Macromonomer	
	Preparation of Graft Copolymers	
	PS Film Specimens Containing the Graft Copolymers	220
	Results and Discussion	
	Preparation of St-Macromonomer	
	Preparation of Graft Copolymers	540
	Influence of Chemical Structure of the Backbone Component in Graft	
	Copolymers	
	Effect of Graft Copolymer Concentration	
	Effect of Graft Copolymer Architecture	
	Permeability of Gases Through the Surface Modified Membrane 3	
	Conclusion	
	Acknowledgements	
	References	
Subject	t Index	351