

# CONTENTS

## Part I General Literature

<b>I. Introduction</b> .....	3
1. General.....	3
2. Historical.....	5
3. Use of Tables and Appendixes.....	6
References.....	8
<b>II. Structure and Nomenclature</b> .....	10
1. Structure.....	10
2. Nomenclature.....	14
References.....	16
<b>III. Synthetic Methods</b> .....	17
1. Radical Attack on Macromolecules.....	17
A. Chain Transfer Reactions.....	17
B. Radical Attack on Unsaturated Polymers.....	18
2. Macromolecular Free Radical Initiators.....	20
A. Hydroperoxidation.....	20
1. Direct Oxidation.....	20
2. Ozonization.....	22
B. Diazotization.....	23
C. Redox Systems.....	24
D. Trapped Radicals.....	26
3. Photochemical Syntheses.....	27
4. Mechanical Degradation.....	32
5. Ionic Synthesis.....	34
A. Initiation by Carbonium Ions.....	34
B. Initiation by Carbanions.....	36
6. Condensation and Ring Opening Reactions.....	40
References.....	45
7. Radiation-Induced Synthesis.....	54
A. The Different Methods of Radiation Grafting.....	55
1. The Direct Grafting Method.....	56

2.	Preirradiation in Air.....	60
3.	Grafting Initiated by Trapped Radicals.....	62
4.	Irradiation of Polymer Mixtures.....	64
6.	Radiation Grafting in Emulsion Systems.....	65
B.	Kinetic Features of Radiation Grafting.....	68
1.	The Direct Radiation Technique.....	68
2.	Grafting with More than One Monomer.....	72
3.	Kinetics in a Homogeneous Preirradiated System.....	73
	References.....	103
<b>IV.</b>	<b>Properties of Block and Graft Copolymers.....</b>	<b>117</b>
1.	Solution Properties.....	118
A.	General.....	118
B.	Solubility of Graft Copolymers.....	119
1.	General.....	119
2.	Thermodynamic Treatment.....	120
	References.....	129
2.	Configuration and Structure of Graft Copolymers in Solution... ..	130
A.	Structure in Dilute Solution.....	131
1.	Solutions in Good Solvent for Both Types of Chains ... ..	136
2.	Solutions in a Solvent Which is a Poor Solvent for One of the Component Chains.....	137
B.	Structure in Concentrated Solutions.....	137
	References.....	139
3.	Compatibility and Structure in the Solid State.....	141
A.	Incompatible Homopolymers.....	142
B.	Compatible Homopolymers.....	146
	References.....	147
4.	Characterization of Graft Copolymers.....	149
A.	General.....	149
B.	Fractionation.....	149
C.	The Significance of Intrinsic Viscosity Measurements of Graft Copolymers.....	152
D.	The Significance of Light Scattering Techniques in the Graft Copolymer Field.....	158
E.	Ultracentrifugation.....	165
F.	The Significance of Osmometry of Graft Copolymers.....	166
G.	Miscellaneous Characterization Techniques.....	168
1.	Flow Birefringence.....	169
2.	X-Ray Scattering in Graft Copolymers.....	170
3.	Polymer Monolayers.....	171
4.	Infrared Spectroscopy.....	172
5.	Gas Chromatography.....	173
	References.....	173

✓ 5.	The Bulk Properties of Graft Copolymers. . . . .	176
	A. Introduction. . . . .	176
	B. Melt Properties. . . . .	178
	C. Thermomechanical Properties. . . . .	181
	D. The Second-Order Transition Temperature of Graft Copolymers. . . . .	190
	* ② Structure of Grafted Chains. . . . .	190
	* ② Molecular Weight of Grafted Chains. . . . .	200
	E. Mechanical Properties of Graft Copolymers. . . . .	204
	1. Compatible of Semicompatible Systems. . . . .	204
	2. Incompatible Systems. . . . .	209
×	F. Miscellaneous Properties. . . . .	216
	1. Modification of Surfaces. . . . .	216
	2. Permeability. . . . .	222
	3. Dielectric and Other Properties. . . . .	222
	G. Grafts of Fibrous Materials. . . . .	223
	References. . . . .	224
V.	<b>Commercial Exploitation of Block and Graft Copolymers. . . . .</b>	<b>233</b>
	1. Nonionic Surface Active Agents. . . . .	233
	2. Cellulose Grafts. . . . .	235
	A. Vinyl Acetate Grafted Cellulose Acetate. . . . .	235
	B. Ethylose. . . . .	235
	3. High Impact Poly(styrene). . . . .	235
×	4. Natural Rubber Grafts. . . . .	236
	5. Acrylonitrile-Butadiene-Styrene Polymers. . . . .	237
	6. Wool Grafts with Improved Properties. . . . .	238
	References. . . . .	239

## Part II Patent Literature

VI.	<b>General Comments on the Patent Literature. . . . .</b>	<b>243</b>
	Appendix I List of Patent Numbers Grouped in Countries and Arranged in Numerical Order. Included also is the Appropriate Reference to Appendixes II and III. . . . .	246
	Appendix II Patent Abstracts Arranged in Order of Application Date. . . . .	257
	Appendix III Patent Abstracts of Unknown Application Data Arranged in Order of Publication Date. . . . .	466
	Appendix IV Table of Companies Holding Graft Copolymer Patents. . . . .	471

Appendix V	Patent Application Statistics for Companies Holding Ten or More Patents; Arranged According to Year of Application . . . . .	475
Appendix VI	Table of Grafting Methods Utilizing Radiation with References to the Appropriate Patents in Appendixes II and III . . . . .	476
Appendix VII	Table of Methods Other Than Radiation for the Synthesis of Graft Copolymers with References to the Appropriate Patents in Appendixes II and III . . . . .	486
Appendix VIII	. . . . .	489
Appendix VIIIA	Index of Graft Copolymers Abstracted in Appendixes II and III Where Both the Polymer Backbone and the Grafted Side Chain Have Been Specifically Defined . . . . .	490
Appendix VIIIB	Index of Graft Copolymers Abstracted in Appendixes II and III Where Either the Backbone or the Grafted Side Chain Has Not Been Specifically Defined . . . . .	513
Appendix VIIIC	Reference List to the Patent Abstracts Where Neither the Backbone Polymer nor the Grafted Side Chain Has Been Specifically Defined . . . . .	520
<b>Author Index</b>	. . . . .	<b>521</b>
<b>Subject Index</b>	. . . . .	<b>539</b>