

CONTENTS

VOLUME 3 APPLICATIONS

Chapter 1 Sanitary Products 1

Section 1 Disposable Diapers

1 Introduction	4
2 Evaluation of Disposable Diapers	5
3 Market for Disposable Diapers for Children	5
4 Development of Trend of Children's Disposable Diapers	7
5 Market Share and Development of Adult Disposable Diapers	9
6 Superabsorbent Polymers for Disposable Diapers	11
7 Environmental Problems	17
8 Future Directions	18
References	19

Section 2 Sanitary Napkins

1 Introduction	21
2 History of Sanitary Napkin	21
3 Market Share Sanitary Napkins	23
4 Structure of Sanitary napkins	26
5 Development of Superabsorbent Polymers for Sanitary Napkins	28
6 Future Directions	33
References	34

Chapter 2 Daily Commodities 35

Section 1 Cosmetics

1 Skin Care Cosmetics	38
2 Hair Care Cosmetics	50
3 Cosmetics for Cleaning	56
References	64

Section 2 Air Fresheners and Deodorizers

1 Introduction	66
2 Gel Air Fresheners and Deodorizers	67
3 Vaporization of Fragrances from Hydrogels	74
4 Future Development of Gel Air Fresheners and Deodorizers	76
References	76

Section 3 Disposable Portable Heaters

1 Introduction	77
2 Future Trends for Disposable Portable heaters	78

Section 4 Sanitary products for Pets

1 Introduction	81
----------------	----

2 Pet Sheets and SAP	81
3 Toilet Sand for Pets and SAP	83
References	85
Section 5 Photographic Films	
1 Silver Halide Photosensitive Materials	86
2 Gelatin Gels	87
3 Swelling of Uncrosslinked Gelatin Films	88
4 Swelling of Crosslinked Gelatin Films	91
5 Mechanical Properties of Gels	95
6 Conclusions	101
References	101
Section 6 Domestic Oil-Treatment Agents	
1 Introduction	103
2 Inhibition Mechanisms of Gelation	104
3 Improvement of Gel Strength	105
References	107
Chapter 3 Foods and Packaging 109	
Section 1 Water-Absorption Sheet for Maintaining Freshness of Foods	
1 Techniques to Maintain Freshness and Functional Packaging Materials	111
2 Basic Structure and Functions of Water-Absorption Sheet for Freshness Preservation of Foods	115
3 Improvement of Water-Absorption Sheet for Freshness Preservation of Foods	116
4 Development Trend of Water-Absorption Sheets for Specific Applications	117
References	119
Section 2 Multifunctional Packaging Materials for Freshness Preservation	
1 Water-absorbing, Multifunctional Packaging Materials	121
2 Multifunctional Packaging Materials with Water-Absorption and Antibacterial Functions	122
3 Multifunctional Packaging Materials with Water Absorption and Deodorant Functions	125
4 Other Multifunctional Packaging Materials	125
References	125
Section 3 Coolants for Food Transportation	
1 Basic Structure and Function of Coolants for Food Transportation	127
2 Improvement of Coolant Shapes for Food Transportation	127
3 Immersing Self-absorbing Coolants	128
4 Improvement of Polymer Hydrogel for Coolants	130
5 Application Examples of Coolants Tailored for a Particular Food	131
References	132
Section 4 Contact-Dehydration Sheet for Food Processing	

1 Structure and Function of Contact –Dehydration Sheet for Food Processing	134
2 Benefits for Cooking and Application Examples of Contact Dehydrating Sheet	135
3 Improvement towards Low-Cost Contact-Dehydration Sheets	137
4 Package Systems that Utilized Contact-Dehydration Sheet	137
References	139
Chapter 4 Medicine and Medical Care	141
Section 1 Gels for Cell Culture	
1 Introduction	145
2 Type I Collagen Gel	147
3 Agarose Gels	149
4 Matrigels	150
5 Conclusion	152
References	153
Section 2 Applications of Gel for Plastic Surgery:	
Artificial Breasts and Skin	
1 Hydrogels and Lyogels	154
2 Silicone Gel-Filled Breast Prosthesis	155
3 Hydrogel-Filled Breast Prosthesis	159
4 Skin Substitutes	159
5 Silicone Gel Sheeting	162
References	163
Section 3 Soft Contact Lenses	
1 Introduction	166
2 History of Contact Lenses	167
3 Classification and Components of Contact Lenses	167
4 Manufacturing Method of Soft Contact Lenses	170
5 Properties of Soft Contact Lenses	172
6 Future Development	174
References	178
Section 4 Absorbable Hydrogels for Medical Use	
1 Introduction	180
2 Hemostatic Agents, Adhesives, and Sealants	180
3 Adhesion Prevention	183
4 Tissue Engineering Matrices and Separation Membranes	186
5 Conclusion	186
References	187
Section 4 Absorbable Hydrogels for Medical Use	
1 Introduction	180
2 Hemostatic Agents, Adhesives, and Sealants	180

3 Adhesion Prevention	183
4 Tissue Engineering Matrices and Separation Membranes	186
5 Conclusion	186
References	187
Section 5 Bioadhesion Gels and Their Applications	
1 What is Bioadhesion Gel?	188
2 Application Areas of Bioadhesion Gels	189
3 Adhesion Mechanisms of Bioadhesion Gels	189
4 Application Examples Based on Location	191
5 Conclusion	199
References	199
Section 6 Transdermal Patches	
1 Introduction	201
2 Manufacturing of Patches	201
3 Characteristics of Patches	203
4 Current Trend of Transdermal Patches	203
5 New Approaches for Transdermal Patches	209
References	210
Section 7 Ointments for Antiinflammatory Drugs	
1 Introduction	211
2 Development of Drug Delivery Systems	213
3 Future Trends	219
References	220
Section 8 Application of Chitosan Medical Care	
1 Introduction	221
2 General Properties of Chitin and Chitasan	223
3 Preparation and Application of Chitin Gels	223
4 Preparation and Application of Chitosan Gels	225
5 Conclusion	227
References	228
Section 9 Sustained Drug Delivery by Gels	
1 Introduction	230
2 Polymers and Gels Used for Drug Delivery Systems	231
3 Gel Functions and Controlled Drug Delivery	231
4 Gels in DDS	239
References	240
Section 10 Medical Sensors	
1 Introduction	241
2 Summary of Medical Sensors	241
3 Application of Gels to Medical Sensors	243

4 Functions of Polymer Gels and Their Application to Sensor Technology	244
5 Conclusion	246
References	246
Section 11 Encapsulation of Cells in Hydrogels	
1 Introduction	248
2 Encapsulation Method for Live Cells in Hydrogels	248
3 Application of Cells Encapsulated in Hydrogels	255
References	257
Chapter 5 Farming and Agriculture	259
Section 1 Characteristics of Superabsorbent Polymer (SAP)-Mixed Soil	
1 Introduction	261
2 Characteristics of SAP for Agriculture and Greening	262
3 Availability of Water Held in SAP to Plants	265
4 Characteristics of a SAP Mixed Soil	268
References	274
Section 2 Application of Superabsorbent Polymers in Japanese Agriculture and Greening	
1 Introduction	276
2 Methods to Mix SAP into Soil	277
3 Conclusion	284
References	285
Section 3 Application of Superabsorbent Polymers to Dry Land	
1 Introduction	286
2 Mexico	286
3 Egypt	287
4 China	289
References	292
Chapter 6 Civil Engineering and Construction	293
Section 1 Civil Engineering and Construction	
1 Introduction	295
2 Application of Water-Swelling Rubbers as Sealants	296
3 Types of Sealants	296
4 Swelling of Water-Swelling Rubbers	298
5 Water-Stopping Capability of Water-Swelling Rubbers	299
6 Basic Design of Sealants	301
7 Conclusion	302
Section 2 Prevention of Water Condensation	
1 Introduction	304
2 Mechanism of Water Condensation and Methods for Preventing Water Condensation Using Polymer Gels	305

3 Characteristics Required for preventing Water Condensation	307
4 Application Example of Superabsorbent Polymer Sheets as a Prevention Material for Water Condensation: Application to Snow Dam	313
5 Conclusion	313
Section 3 Fireproof Materials	
1 Introduction	316
2 Fireproof Covering Materials	318
3 Application of Superabsorbent Polymers	319
4 Fireproof Covering Material, Aquacover	320
5 Future Challenges	322
Section 4 Sealed Construction Method	
1 Introduction	323
2 Types of Tunnel Digging Methods	323
3 Various Methods in Sealed Construction Method	324
4 The Characteristics of Soils from Sealed Digging	328
5 Improvement of Sealed Soil	334
6 Conclusion	335
References	335
Section 5 Gelation of Waste Mud (Gelation of Construction Waste Mud)	
1 Introduction	336
2 Treatment and Dumping of Construction Waste Mud	339
3 Improvement Treatment of Waste Mud by Addition of a Chemical Agent	342
4 Conclusion	348
References	348
Chapter 7 Chemical Industries	349
Section 1 Application of Gels for Separation Matrices	
1 Introduction	352
2 Classification of Gels Based on the Shape and Chemical Structure of Particular Gels	353
3 Separation Mechanisms and Separation Agents	358
References	361
Section 2 Application for Tissue Culture of Plants	
Section 3 Oleogels and Their Applications	372
4 Fundamental Properties of Oleogels	373
5 Application of Oleogels	377
6 Conclusion	379
References	379
Section 4 Application of Superabsorbent Polymers Gels to Oil-Water Separation (Use of Superabsorbent Polymer Containing Sheet)	

1 Introduction	381
2 Separation and Gelation of Fine Oil Particles and Emulsified Oils	383
3 Practical Aspects of Oil-Water Separation Sheet	383
4 Conclusion	389
References	392
Section 5 Application of Gels to Latent Heat Thermal Storage Media	
1 Introduction	393
2 Inorganic Hydration Salt Type Thermal Storage Media	395
3 Thermal Storage Media from Organic Compounds	399
References	400
Section 6 Application for Electrophoresis	
1 Introduction	401
2 Polyacrylamide and Agarose Gels	402
3 Newly Developed Gels	404
4 Conclusion	407
References	407
Chapter 8 Electric and Electronic Industries	409
Section 1 Communication Cables	
1 Introduction	411
2 Properties Required of Superabsorbent Polymers for Communication Cables	412
3 Water-Absorbing Wraparound Tapes	413
4 Water-Absorbing Materials made of Fibers, Strings, and Narrow-width Tapes	415
5 Jelly-like Water-Absorbing Materials	415
6 Direct-Coating Type Water-absorbing Materials	417
7 Application to Power Cables and Others, Conclusion	419
References	419
Section 2 Batteries	
1 Primary Batteries	421
2 Auxiliary Batteries	432
References	443
Section 3 Fuel Cells	
1 What is a Fuel Cells	445
2 Polymer Electrolyte Fuel Cells	447
3 Development of Polymer Electrolyte Fuel Cells	448
4 Solid Electrolytes	449
5 Problems of Polymer Electrolyte Fuel Cells	451
6 Conclusion	452
References	453

Section 4 Sensors	
1 Enzyme Sensors	455
2 Humidity Sensors	462
References	475
Chapter 9 Sport and Leisure Activity Industries	479
Section 1 Sporting Goods Applications	
1 Introduction	480
2 Application of Gels to Areas Other than Shoes	488
3 Development of Tennis Shoes	484
4 Application of Gels to Areas Other than Shoes	488
5 Patented Application Examples	489
6 Conclusion	489
References	490
Section 2 Artificial Snow	
1 Introduction	491
2 Brief Explanation of the Superabsorbent Polymer Method	492
3 Properties of Polymer Mixed Snow	492
4 Conclusion	501