

# Contents

<b>1 Polymeric Materials: Preparation and Properties.....</b>	<b>1</b>
1.1 Preparation of Polymeric Materials .....	2
1.1.1 Preparation of Synthetic Polymeric Materials .....	3
1.1.2 Chemical Modification of Polymeric Materials .....	12
1.1.3 Advanced Polymeric Materials .....	30
1.2 Properties of Polymeric Materials .....	37
1.2.1 Physical Forms .....	37
1.2.2 Porosity and Surface Properties .....	45
1.2.3 Solvation Behavior: Swelling and Solubility of Polymers ...	47
1.2.4 Permeability and Diffusion .....	48
1.2.5 Adhesion.....	52
1.2.6 Polymer Deterioration and Stabilization.....	53
References.....	54

## Part I Applications of Polymers in Agriculture

<b>2 Polymers in Plantation and Plants Protection.....</b>	<b>65</b>
2.1 Polymers in Plantations.....	65
2.1.1 Soil Conditioners.....	66
2.1.2 Container and Pot Plantations .....	74
2.1.3 Gel Planting and Transplanting.....	76
2.1.4 Seed Coating Germination .....	76
2.1.5 Soil Aeration.....	78
2.1.6 Soil Sterilization.....	78
2.2 Polymers in Plant and Crop Protection.....	79
2.2.1 Creation of Climate .....	80
2.2.2 Windbreaks.....	92
2.2.3 Polymers in Crop Preservation and Storage.....	95

2.3	Polymers as Building Construction Materials .....	98
2.3.1	Polymers in Farm Buildings.....	99
2.3.2	Semipermanent Structures .....	108
2.3.3	Polymers in Agricultural Equipment and Machinery.....	108
2.4	Polymers in Water Handling and Management .....	109
2.4.1	Water Types .....	110
2.4.2	Polymers in Water Treatment.....	111
2.4.3	Polymers in Irrigation .....	116
2.4.4	Polymers in Drainage.....	120
2.4.5	Polymers in Water Collection and Storage .....	122
	References.....	125
<b>3</b>	<b>Polymers in the Controlled Release of Agrochemicals .....</b>	<b>133</b>
3.1	Principals of Controlled Release Formulations .....	133
3.2	Polymers in Physical Combinations of Agrochemicals .....	135
3.2.1	Encapsulations.....	135
3.2.2	Reservoir Systems .....	138
3.2.3	Monolithic Systems.....	139
3.2.4	Laminated Structures .....	140
3.3	Polymers in Chemical Combinations of Agrochemicals .....	142
3.3.1	Release Mechanism.....	144
3.3.2	Ion Exchange Resins Containing Biocides .....	145
3.4	Polymeric Agrochemicals and Related Biocides .....	146
3.4.1	Polymeric Herbicides.....	147
3.4.2	Polymeric Plant Growth Regulators.....	156
3.4.3	Polymeric Fertilizers .....	158
3.4.4	Polymers in Stored Food Protection .....	163
3.4.5	Polymeric Insecticides .....	165
3.4.6	Polymeric Molluscicides.....	170
3.4.7	Polymeric Antifouling Paints .....	174
3.4.8	Polymeric Fungicides in Wood Preservation .....	176
3.4.9	Polymeric Antimicrobials.....	181
	References.....	184

## **Part II Applications of Polymers in Food**

<b>4</b>	<b>Polymers in Food Processing Industries .....</b>	<b>195</b>
4.1	Polymers in Food Production.....	197
4.1.1	Ion-Exchange Resin Catalysts in the Food Industry .....	197
4.1.2	Immobilized Enzymes in the Food Industry .....	199
4.1.3	Membranes in the Food Industry .....	204
4.2	Polymers in the Dairy Industry .....	206
4.2.1	Milk Treatment.....	206
4.2.2	Whey Treatment .....	210
4.2.3	Other Dairy Applications .....	214

4.3	Polymers in the Sugar Industry .....	214
4.3.1	Sucrose Manufacturing .....	214
4.3.2	Liquid Sugar Manufacture .....	216
4.3.3	Isomerization of Glucose to Fructose .....	219
4.3.4	Purification of Raw Sugars.....	220
4.3.5	By-products Recovery.....	226
4.4	Polymers in the Juice and Beverage Industry .....	226
4.4.1	Fruit Juice Production and Purification.....	227
4.4.2	Dry Milk Beverage Mix Composition .....	228
4.4.3	Wine and Beer Production .....	228
4.5	Polymers in Tomato Sauce Production .....	234
4.6	Polymers in Potable Water .....	236
4.6.1	Water Sources.....	237
4.6.2	Water Treatment .....	237
	References.....	244
<b>5</b>	<b>Polymeric Food Additives.....</b>	<b>249</b>
5.1	Polymeric Food Colorants .....	251
5.2	Polymeric Food Antioxidants .....	254
5.3	Polymeric Nonnutritive Sweeteners .....	261
5.4	Polymeric Nonnutritive Hydrocolloids.....	266
5.4.1	Polymeric Thickening Agents .....	268
5.4.2	Polymeric Gelling Agents .....	270
5.4.3	Polymeric Stabilizers .....	271
5.4.4	Polymeric Crystallization Inhibitors .....	273
5.4.5	Fibrous Simulated Food Product with Gel Structure .....	274
5.4.6	Polymeric Flavors .....	274
5.4.7	Polymeric Defoamers.....	276
5.4.8	Polymeric Preservatives .....	277
5.5	Animal Polymeric Feed Additives .....	278
5.6	Polymeric Indicators and Biosensors in Food .....	281
5.6.1	Polymeric pH Indicators in Food .....	281
5.6.2	Polymeric Biosensors.....	286
	References.....	288
<b>6</b>	<b>Polymers in Food Packaging and Protection.....</b>	<b>293</b>
6.1	Polymeric Traditional Food Packages .....	295
6.1.1	Types of Food Packages.....	296
6.1.2	Synthetic Polymeric Food Packages .....	299
6.1.3	Selection of Polymeric Packaging Materials .....	304
6.1.4	Factors Affecting Packaging Materials .....	309
6.2	Polymeric Coatings in Metal Food Cans .....	311
6.2.1	Metal Food Cans .....	311
6.2.2	Polymeric Coatings .....	313
6.2.3	Factors Affecting Polymeric Coatings .....	317
6.3	Polymeric Biodegradable Packages .....	318

6.4	Polymeric Preservative Food Packages .....	319
6.4.1	Polymeric Antioxidant Packages.....	320
6.4.2	Polymers in Insect Repellent Packages.....	322
6.4.3	Polymeric Antimicrobial Packages .....	323
6.5	Polymeric Active Packages.....	327
6.5.1	Gas Scavenging Packages .....	328
6.5.2	Flavor and Odor (Absorbers) Removing Packages.....	332
6.5.3	Polymeric Moisture Control (Absorbers) Packages.....	333
6.5.4	Ethanol Emitter Packages .....	334
6.5.5	Temperature Control Packages.....	334
6.5.6	Polymers in Microwave Susceptors for Food Packages .....	334
6.6	Polymeric Modified Atmosphere Packaging (MAP) .....	337
6.7	Polymeric Smart and Intelligent Food Packages .....	339
	References.....	343
	<b>Abbreviations</b> .....	349
	<b>Index</b> .....	355

Functionalized Polymeric Materials in Agriculture and  
the Food Industry

Akelah, A.

2013, XIV, 367 p., Hardcover

ISBN: 978-1-4614-7060-1