

Contents

Series Preface	xi
Preface	xiii
Acknowledgements	xvii
List of Contributors	xix
Part 1 Renewable Hydrophobes	1
1 Surfactants Based on Natural Fatty Acids	3
<i>Martin Svensson</i>	
1.1 Introduction and History	3
1.2 Fats and Oils as Raw Materials	4
1.3 Fatty Acid Soaps	5
1.4 Polyethylene Glycol Fatty Acid Esters	10
1.5 Polyglycerol Fatty Acid Esters	11
1.6 Conclusions	13
References	15
2 Nitrogen Derivatives of Natural Fats and Oils	21
<i>Ralph Franklin</i>	
2.1 Introduction	21
2.2 Manufacture of Fatty Nitrogen Derivatives	22
2.3 Production Data	30
2.4 Ecological Aspects	30
2.5 Biodegradation	31
2.6 Properties of Nitrogen-Based Surfactants	33
2.7 Applications	35
2.8 Conclusions	39
References	40

3	Surface-Active Compounds as Forest-Industry By-Products	45
	<i>Bjarne Holmbom, Anna Sundberg and Anders Strand</i>	
3.1	Introduction	45
3.2	Resin and Fatty Acids	46
3.3	Sterols and Sterol Ethoxylates	54
3.4	Hemicelluloses	56
	Acknowledgements	58
	References	59
Part 2	Renewable Hydrophiles	63
4	Surfactants Based on Carbohydrates and Proteins for Consumer Products and Technical Applications	65
	<i>Karlheinz Hill</i>	
4.1	Introduction	65
4.2	Raw Materials	65
4.3	Products and Applications	67
4.4	Conclusion	81
	Acknowledgements	81
	References	81
5	Amino Acids, Lactic Acid and Ascorbic Acid as Raw Materials for Biocompatible Surfactants	85
	<i>Carmen Moran, Lourdes Perez, Ramon Pons, Aurora Pinazo and Maria Rosa Infante</i>	
5.1	Introduction	85
5.2	Production of Raw Materials	86
5.3	Lysine-Based Surfactants	87
5.4	Lactic Acid-Based Surfactants	94
5.5	Ascorbic Acid-Based Surfactants	97
	References	100
Part 3	New Ways of Making Renewable Building Blocks	109
6	Ethylene from Renewable Resources	111
	<i>Anna Lundgren and Thomas Hjertberg</i>	
6.1	Introduction	111
6.2	Why Produce Ethylene from Renewable Resources?	113
6.3	Production of Ethylene from Renewable Feedstock	115
6.4	Commercialization of Bioethylene	121
6.5	Environmental Impact of Bioethylene	123
6.6	Certificate of Green Carbon Content	124
6.7	Concluding Remarks	125
	References	125

7	Fermentation-Based Building Blocks for Renewable Resource-Based Surfactants	127
	<i>Kris Arvid Berglund, Ulrika Rova and David B. Hodge</i>	
7.1	Introduction	127
7.2	Existing and Potential Classes of Surfactants from Biologically Derived Metabolites	129
7.3	Fermentation-Based Building Blocks with Large Existing Markets	131
7.4	New Fermentation-Based Building Blocks	133
7.5	Conclusion	138
	References	138
Part 4	Biosurfactants	143
8	Synthesis of Surfactants Using Enzymes	145
	<i>Patrick Adlercreutz and Rajni Hatti-Kaul</i>	
8.1	Introduction	145
8.2	Enzymes as Catalysts for Synthesis of Surfactants	146
8.3	Enzymatic Synthesis of Polar Lipids Useful as Surfactants	147
8.4	Carbohydrate Esters	148
8.5	Fatty Amide Surfactants	151
8.6	Amino Acid-Based Surfactants	155
8.7	Alkyl Glycosides	158
8.8	Future Prospects	160
	Acknowledgements	161
	References	161
9	Surfactants from Waste Biomass	167
	<i>Flor Yunuen García-Becerra, David Grant Allen and Edgar Joel Acosta</i>	
9.1	Introduction	167
9.2	Surfactants Obtained from Biological Transformation of Waste Biomass	168
9.3	Surfactants Obtained from Chemical Transformation of Waste Biomass	177
9.4	Summary and Outlook	185
	References	185
10	Lecithin and Other Phospholipids	191
	<i>Willem van Nieuwenhuizen</i>	
10.1	Introduction	191
10.2	Sources and Production	191
10.3	Composition	195
10.4	Quality and Analysis of Lecithins	196
10.5	Modification	198
10.6	Emulsifying Properties	203

10.7	Applications	206
10.8	Legislation and Reach	209
10.9	Conclusion	211
	References	211
11	Sophorolipids and Rhamnolipids	213
	<i>Dirk W. G. Develter and Steve J. J. Fleurackers</i>	
11.1	Sophorolipids	213
11.2	Derivatives of Native Sophorolipids	224
11.3	Biosynthesis of Novel Sophorolipids	227
11.4	Rhamnolipids	230
11.5	Cleaning Applications Using Sophorolipids and Rhamnolipids	234
	References	236
12	Saponin-Based Surfactants	239
	<i>Wieslaw Oleszek and Arafat Hamed</i>	
12.1	Introduction	239
12.2	Molecular Properties	240
12.3	Sources of Saponins	242
12.4	Saponins as Emulsifiers and Surfactants	242
12.5	Application of Saponins as Surfactants and Emulsifiers	245
	Acknowledgements	248
	References	248
Part 5	Polymeric Surfactants/Surface-Active Polymers	251
13	Surface-Active Polymers from Cellulose	253
	<i>Leif Karlson</i>	
13.1	Introduction	253
13.2	Structure and Synthesis of Cellulose Ether	254
13.3	Cellulose Ethers in Aqueous Solution	257
13.4	Interaction with Surfactants	262
13.5	Clouding	263
	References	265
14	New Developments in the Commercial Utilization of Lignosulfonates	269
	<i>Rolf Andreas Lauten, Bernt O. Myrvold and Stig Are Gundersen</i>	
14.1	Introduction	269
14.2	Lignosulfonates	269
14.3	Lignosulfonate Production	271
14.4	Environmental Issues	272
14.5	Lignosulfonates as Stabilizers for Emulsions and Suspoemulsions	274

14.6	Superplasticizers for Concrete	279
14.7	Summary	280
	Acknowledgements	281
	References	281
15	Dispersion Stabilizers Based on Inulin	285
	<i>Tharwat Tadros and Bart Levecké</i>	
15.1	Introduction	285
15.2	Solution Properties of Long-Chain Inulin and Hydrophobically Modified Inulin (HMI)	288
15.3	Interfacial Aspects of HMI at Various Interfaces	289
15.4	Emulsions Stabilized Using HMI	290
15.5	Emulsion Polymerization Using HMI	293
15.6	Use of HMI for Preparation and Stabilization of Nanoemulsions	295
	References	300
	Index	303

