

# Contents

<b>Chapter 1 Overview of Food Emulsifiers.....</b>	<b>1</b>
Gerard L. Hasenhuettl	
1.1 Introduction.....	1
1.2 Emulsifiers as Food Additives .....	2
1.3 Emulsifier Structure.....	4
1.4 Surface Active Hydrocolloids.....	7
1.5 Emulsifier Functionality .....	7
<b>Chapter 2 Synthesis and Commercial Preparation of Food Emulsifiers .....</b>	<b>11</b>
Gerard L. Hasenhuettl	
2.1 Functional Group Design Principles.....	11
2.2 Mono- and Diacylglycerols (Mono- and Diglycerides).....	14
2.3 Propylene Glycol Esters of Fatty Acids.....	16
2.4 Polyglycerol Esters of Fatty Acids .....	17
2.5 Sorbitan Monostearate and Tristearate .....	18
2.6 Sucrose Esters .....	19
2.7 Sodium and Calcium Stearyl Lactylate .....	21
2.8 Derivatives of Monoacylglycerols .....	21
2.9 Polyoxyethylene Derivatives .....	25
2.10 Modification of Naturally Occurring Species.....	26
2.11 Commercial Preparation of Food Surfactants.....	30
<b>Chapter 3 Analysis of Food Emulsifiers.....</b>	<b>39</b>
Gerard L. Hasenhuettl	
3.1 Thin Layer and Column Chromatography.....	40
3.2 Wet Chemical Analysis.....	41
3.3 Measurement of Physical Properties .....	48
3.4 Instrumental Methods of Analysis.....	50
3.5 Setting Specifications .....	57

<b>Chapter 4 Emulsifier-Carbohydrate Interactions.....</b>	<b>63</b>
Gerard L. Hasenhuettl	
4.1 Interactions with Simple Saccharides.....	63
4.2 Starch/Surfactant Complexes.....	64
4.3 Effect of External Lipids on Starch Properties .....	65
4.4 Lipid Adjunct and Surfactant Properties .....	74
4.5 Physical Properties of Starch/Surfactant Complexes.....	76
4.6 Surfactant/Hydrocolloid Interactions.....	81
4.7 Summary.....	83
<b>Chapter 5 Protein/Emulsifier Interactions .....</b>	<b>89</b>
Tommy Nylander, Thomas Arnebrant, Martin Bos, and Peter Wilde	
5.1 Introduction.....	89
5.2 Properties of Proteins and Emulsifiers.....	90
5.3 Protein/Emulsifier Interaction in Solution.....	97
5.4 Interaction between Protein and Surfactants or Polar Lipids at Interfaces .....	114
5.5 Applications.....	144
5.6 Conclusion .....	156
<b>Chapter 6 Physicochemical Aspects of an Emulsifier Functionality .....</b>	<b>173</b>
Björn Bergenståhl	
6.1 Introduction.....	173
6.2 Surface Activity .....	173
6.3 Solution Properties of Emulsifiers .....	175
6.4 The Use of Phase Diagrams to Understand Emulsifier Properties .....	177
6.5 Examples of the Relation between Phase Diagrams and Emulsion Stability .....	179
6.6 Some Ways to Classify Emulsifiers.....	185
6.7 The Emulsifier Surface .....	190
<b>Chapter 7 Emulsifiers in Dairy Products and Dairy Substitutes.....</b>	<b>195</b>
Stephen R. Euston	
7.1 Introduction.....	195
7.2 Ice Cream.....	196
7.3 Whipped Cream and Whipping Cream.....	204
7.4 Whipped Toppings.....	207
7.5 Cream Liqueurs .....	210
7.6 Creams and Coffee Whiteners .....	213

Contents	xii	
7.7	Cheese, Processed Cheese and Cheese Products.....	215
7.8	Recombined, Concentrated, and Evaporated Milks and Dairy Protein-Based Emulsions.....	219
7.9	Other Dairy Applications of Emulsifiers .....	223
7.10	Summary .....	224
<b>Chapter 8</b>	<b>Emulsifiers in Infant Nutritional Products.....</b>	<b>233</b>
	Séamus L. McSweeney	
8.1	Introduction.....	233
8.2	Types of Infant Nutritional Products .....	233
8.3	Emulsion Formation and Stabilisation.....	235
8.4	Emulsifying Ingredients in Infant Nutritional Products.....	238
8.5	Stabilising Agents Used in Infant Nutritional Products.....	241
8.6	Emulsifier Functionality in Infant Nutritional Products.....	241
8.7	Summary .....	255
<b>Chapter 9</b>	<b>Applications of Emulsifiers in Baked Foods.....</b>	<b>263</b>
	Frank Orthofer	
9.1	Introduction.....	263
9.2	History of Bakery Emulsifiers .....	263
9.3	Definition of Emulsifiers .....	264
9.4	Emulsifier Function in Baked Goods.....	265
9.5	Role of the Shortening .....	267
9.6	Role of the Emulsifier.....	268
9.7	Emulsifier Interaction with Bakery Components .....	272
9.8	Applications in Baked Goods .....	276
9.9	Summary .....	283
<b>Chapter 10</b>	<b>Emulsifiers in Confectionery .....</b>	<b>285</b>
	Mark Weyland and Richard Hartel	
10.1	Introduction.....	285
10.2	Emulsifiers in Chocolate and Compound Coatings .....	286
10.3	Anti-Bloom Agents in Chocolate and Compound Coatings .....	295
10.4	Other Emulsifiers Used in Coatings .....	298
10.5	Emulsifiers in Non-Chocolate Confectionery.....	299
10.6	Chewing Gum .....	300
10.7	Processing Aids .....	303
10.8	Summary .....	304

<b>Chapter 11 Margarines and Spreads .....</b>	<b>307</b>
Niall Young and Paul Wassell	
11.1 Introduction.....	307
11.2 The Rise of Margarine .....	308
11.3 Terms and Terminology .....	309
11.4 Building Blocks and Structure.....	310
11.5 Emulsifiers.....	317
11.6 Industrial Cake and Cream Margarine.....	318
11.7 Puff Pastry Margarine .....	320
11.8 Industrial Fillings.....	321
11.9 Reduced- Low-Fat Spreads.....	321
11.10 Product Spoilage .....	323
11.11 Summary.....	325
<b>Chapter 12 Application of Emulsifiers to Reduce Fat and Enhance Nutritional Quality .....</b>	<b>327</b>
Matt Golding and Eddie Pelan	
12.1 Introduction.....	327
12.2 Homogenised Dairy and Non-Dairy Whipping Creams .....	328
12.3 Reduced and Low Fat Ice Cream.....	333
12.4 Zero Fat Ice Cream .....	339
12.5 Margarine.....	341
<b>Chapter 13 Guidelines for Processing Emulsion-Based Foods .....</b>	<b>349</b>
Ganesan Narsimhan and Zebin Wang	
13.1 Introduction.....	349
13.2 Emulsification Equipment .....	350
13.3 Droplet Phenomena .....	354
13.4 Example of Emulsion Based Food Products.....	387
13.5 Guidelines for Selection of Food Emulsifiers.....	389
<b>Chapter 14 Forecasting the Future of Food Emulsifiers .....</b>	<b>395</b>
Gerard L. Hasenhuettl	
14.1 Globalization of the Food Industry.....	395
14.2 Nutritionally Driven Changes in Foods .....	396
14.3 Advances in Science and Technology.....	398
14.4 Design, Synthesis, and Commercial Preparation.....	400
14.5 Applications at the Frontiers.....	400
<b>Index.....</b>	<b>403</b>