

Contents

Preface — v

Part I: Colloid and interface science in pharmacy

1	Disperse systems — 3
1.1	Thermodynamic considerations — 3
1.2	Stabilization of dispersions — 4
1.3	Nanodispersions — 11
2	Surface activity and colloidal properties of drugs — 31
2.1	Introduction — 31
2.2	Investigating the association behaviour of drugs — 31
2.3	Naturally occurring micelle forming systems — 34
2.4	Biological implications of the presence of surfactants in pharmaceutical formulations — 39
3	Solubilized systems, liposomes and vesicles in pharmacy — 43
3.1	Introduction — 43
3.2	Analysis of solubilization — 44
3.3	Experimental methods for studying solubilization — 45
3.3.1	Maximum additive concentration — 45
3.3.2	Micelle-water distribution equilibria — 46
3.3.3	Determination of location of solubilize — 47
3.4	Quantitative methods for obtaining the exact location of solubilize — 47
3.4.1	X-ray diffraction — 47
3.4.2	Absorption spectrometry — 48
3.4.3	NMR methods — 48
3.4.4	Fluorescence depolarization — 48
3.4.5	Electron spin resonance (ESR) — 49
3.5	Mobility of solubilize molecules — 49
3.6	Factors affecting solubilization — 49
3.6.1	Solubilize structure — 49
3.6.2	Surfactant structure — 49
3.6.3	Temperature — 50
3.6.4	Addition of electrolytes and non-electrolytes — 50
3.7	Liposomes and vesicles in pharmacy — 50
3.7.1	Driving force for formation of vesicles — 53

3.7.2	Stabilization of liposomes by incorporation of block copolymers —	57
3.8	Liquid crystalline phases and microemulsions —	59
4	Solid lipid nanoparticles, polymer gels and capsules —	65
4.1	Solid lipid nanoparticles (SLN) —	65
4.2	Polymer gels, microgels and capsules —	65
4.3	Solid polymer nanoparticles —	70
5	Drug delivery and drug targeting —	73
5.1	Introduction —	73
5.2	Polymeric nanoparticles —	73
5.3	Biodegradable nanoparticles —	77

Part II: Colloid and interface science in cosmetics and personal care

6	Surfactants used in cosmetic and personal care formulations, their properties and surfactant–polymer interaction —	97
6.1	Surfactant classes —	97
6.2	Physical properties of surfactant solutions and the process of micellization —	109
6.3	Thermodynamics of micellization —	115
6.4	Surfactant–polymer interaction —	122
7	Cosmetic emulsions —	133
7.1	Introduction —	133
7.2	Thermodynamics of emulsion formation —	133
7.3	Emulsion breakdown processes and their prevention —	135
7.4	Selection of emulsifiers —	139
7.4.1	The hydrophilic-lipophilic balance (HLB) concept —	139
7.4.2	The phase inversion temperature (PIT) concept —	145
7.5	Mechanism of emulsification —	147
7.6	Rheological properties of cosmetic emulsions —	153
8	Nanoemulsions in cosmetics —	159
8.1	Introduction —	159
8.2	Colloid stability of nanoemulsions —	160
8.3	Preparation of nanoemulsions using high pressure homogenizers —	163
8.4	Low-energy methods for preparing nanoemulsions —	171

- 8.4.1 Phase inversion composition (PIC) principle — 172
- 8.4.2 Phase inversion temperature (PIT) principle — 173
- 8.4.3 Preparation of nanoemulsions by dilution of microemulsions — 175
- 8.5 Preparation of nanoemulsions using the PIT technique — 176
- 8.6 Nanoemulsions based on polymeric surfactants — 185

9 Multiple emulsions in cosmetics — 193

- 9.1 Introduction — 193
- 9.2 Types of multiple emulsions — 194
- 9.3 Breakdown processes of multiple emulsions — 194
- 9.4 Preparation of multiple emulsions — 195
 - 9.4.1 The two-step process — 196
 - 9.4.2 The phase inversion method — 199
 - 9.4.3 Lamellar phase dispersion process — 200
 - 9.4.4 The oily isotropic dispersion process — 201
- 9.5 Main parameters that need to be controlled in the preparation of W/O/W multiple emulsions for cosmetic applications — 201
 - 9.5.1 Nature of the oil — 201
 - 9.5.2 Nature of the emulsifier — 201
 - 9.5.3 Gelling agents — 202
 - 9.5.4 Osmotic pressure control — 202
- 9.6 Examples of W/O/W multiple emulsions — 202
- 9.7 Characterization of multiple emulsions — 205
 - 9.7.1 Droplet size analysis — 205
 - 9.7.2 Dialysis — 206
 - 9.7.3 Rheological techniques — 206
- 9.8 Summary of the factors affecting stability of multiple emulsions and criteria for their stabilization — 210

10 Shampoos, gels and hair conditioners — 213

- 10.1 Introduction — 213
- 10.2 Surfactants for use in shampoo formulations — 214
 - 10.2.1 Anionic surfactants — 214
 - 10.2.2 Amphoteric surfactants — 215
 - 10.2.3 Nonionic surfactants — 215
- 10.3 Properties of a shampoo — 216
- 10.4 Components of a shampoo — 217
 - 10.4.1 Cleansing agents — 217
 - 10.4.2 Foam boosters — 218
 - 10.4.3 Thickening agents — 218
 - 10.4.4 Preservatives — 218
 - 10.4.5 Miscellaneous additives — 219

10.5	Role of the components —	219
10.5.1	Behaviour of mixed surfactant systems —	219
10.5.2	Cleansing function —	220
10.5.3	Foam boosters —	221
10.5.4	Thickeners and rheology modifiers —	222
10.5.5	Silicone oil emulsions in shampoos —	224
10.6	Use of associative thickeners as rheology modifiers in shampoos —	224
10.7	Morphology of hair —	228
10.8	Surface properties of hair —	230
10.8.1	Wettability investigations —	230
10.8.2	Electrokinetic studies —	234
10.9	Role of surfactants and polymers in hair conditioners —	234
11	Sunscreens for UV protection —	241
11.1	Introduction —	241
11.2	Mechanism of absorbance and scattering by TiO_2 and ZnO —	242
11.3	Preparation of well-dispersed particles —	243
11.4	Experimental results for sterically stabilized TiO_2 dispersions in nonaqueous media —	247
11.5	Competitive interactions in sunscreen formulations —	255
12	Colour cosmetics —	259
12.1	Introduction —	259
12.2	Fundamental principles for preparation of a stable colour cosmetic dispersion —	260
12.2.1	Powder wetting —	260
12.2.2	Powder dispersion and milling (comminution) —	264
12.2.3	Stabilization of the dispersion against aggregation —	265
12.3	Classes of dispersing agents —	270
12.4	Assessment of dispersants —	272
12.4.1	Adsorption isotherms —	272
12.4.2	Measurement of dispersion and particle size distribution —	273
12.4.3	Rheological measurements —	273
12.5	Application of the above fundamental principles to colour cosmetics —	275
12.6	Principles of preparation of colour cosmetics —	277
12.7	Competitive interactions in colour cosmetic formulations —	279

Index —	281
----------------	------------