
Contents

Preface vii

1 Introduction 1

- 1.1 Introduction 1
- 1.2 Intermolecular Interactions 3
- 1.3 Structural Organization 9
- 1.4 Dynamics 12
- 1.5 Phase Transitions 14
- 1.6 Order Parameters 20
- 1.7 Scaling Laws 22
- 1.8 Polydispersity 22
- 1.9 Experimental Techniques for Investigating Soft Matter 23
- 1.10 Computer Simulation 41
- Further Reading 45

2 Polymers 47

- 2.1 Introduction 47
- 2.2 Synthesis 49
- 2.3 Polymer Chain Conformation 53
- 2.4 Characterization 61
- 2.5 Polymer Solutions 74
- 2.6 Amorphous Polymers 90
- 2.7 Crystalline Polymers 101
- 2.8 Plastics 111
- 2.9 Rubber 111
- 2.10 Fibres 115
- 2.11 Polymer Blends and Block Copolymers 118
- 2.12 Biopolymers 121
- Further Reading 127
- Questions 127

3 Colloids 133

- 3.1 Introduction 133
- 3.2 Types of Colloids 135
- 3.3 Forces between Colloidal Particles 136
- 3.4 Characterization of Colloids 141

3.5	Charge Stabilization	150
3.6	Steric Stabilization	155
3.7	Effect of Polymers on Colloid Stability	159
3.8	Kinetic Properties	161
3.9	Sols	162
3.10	Gels	164
3.11	Clays	165
3.12	Foams	168
3.13	Emulsions	170
3.14	Food Colloids	179
3.15	Concentrated Colloidal Dispersions	187
	Further Reading	189
	Questions	190
4	Amphiphiles	193
4.1	Introduction	193
4.2	Types of Amphiphile	195
4.3	Surface Activity	201
4.4	Surfactant Monolayers and Langmuir-Blodgett Films	207
4.5	Adsorption at Solid Interfaces	213
4.6	Micellization and the Critical Micelle Concentration	216
4.7	Detergency	232
4.8	Solubilization in Micelles	237
4.9	Interfacial Curvature and Its Relationship to Molecular Structure	239
4.10	Liquid Crystal Phases at High Concentrations	244
4.11	Membranes	252
4.12	Templated Structures	259
	Further Reading	263
	Questions	263
5	Liquid Crystals	267
5.1	Introduction	267
5.2	Types of Liquid Crystals	268
5.3	Characteristics of Liquid Crystal Phases	282
5.4	Identification of Liquid Crystal Phases	287
5.5	Orientational Order	296
5.6	Elastic Properties	305
5.7	Phase Transitions in Liquid Crystals	307
5.8	Applications of Liquid Crystals	311
	Further Reading	323
	Questions	324
	Numerical Solutions to Questions	329
	Index	333