

Table of contents

- **Foreword** (p. xiii)
- **Preface** (p. xv)
- **1.3 Miscible Polymer Blends** (p. 7)
- **1.5 Natural Polymers** (p. 9)
- **1.5.4 Quaternary Structure** (p. 13)
- **References** (p. 21)
- **Chapter 2 Equation of State Theories for Polymers** (p. 23)
- **Learning Objectives** (p. 23)
- **2.1.2 Derivation of Ideal Gas Law** (p. 25)
- **About the Author** (p. xix)
- **1.6 Polymer Alloys** (p. 16)
- **Chapter 1 Introduction to Polymer Blends** (p. 1)
- **Learning Objectives** (p. 1)
- **1.1 History of Polymer Blends** (p. 2)
- **1.5.3 Tertiary Structure** (p. 12)
- **1.2 Flory-Huggin's Solution Theory-and Beyond** (p. 4)
- **1.4 Partially Miscible Polymer Blends** (p. 8)
- **Exercises** (p. 20)
- **2.1 Small Molecules and Large Molecules** (p. 23)
- **1.5.1 Primary Structure** (p. 10)
- **1.7 Summary** (p. 18)
- **1.5.2 Secondary Structure** (p. 11)
- **2.1.1 Kinetic Representation of Pressure** (p. 24)
- **2.1.3 Van der Waals Cubic Equation of State** (p. 27)
- **2.1.4 Virial Equation of State** (p. 28)
- **2.2 PVT Relations for Polymeric Liquids** (p. 30)
- **2.3 Tait Equation** (p. 30)
- **2.4 Flory, Orwoll, and VRIJ (FOV) Model** (p. 32)
- **2.5 Prigogine Square-Well Cell Model** (p. 35)
- **2.6 Lattice Fluid Model of Sanchez and Lacombe** (p. 37)
- **2.7 Negative Coefficient of Thermal Expansion** (p. 44)
- **2.7.2 Violation of Second Law of Thermodynamics** (p. 46)
- **2.7.4 Measurements of Volume Expansivity Not Isobaric** (p. 49)
- **2.1.5 Redlich and Kwong Equation of State and Soave Modification** (p. 28)
- **2.7.1 Historical Note** (p. 45)
- **2.7.3 Proposed Isentropic Expansivity** (p. 47)
- **2.8 Summary** (p. 49)
- **Problems** (p. 50)
- **Review Questions** (p. 54)
- **References** (p. 55)
- **Chapter 3 Binary Interaction Model** (p. 57)
- **Learning Objectives** (p. 57)
- **3.1 Introduction** (p. 57)

- **3.2 Compositional Window of Miscibility: Copolymer-Homopolymer** (p. 59)
- **3.3 Compositional Window of Miscibility: Copolymers with Common Monomers** (p. 60)
- **3.4 Compositional Window of Miscibility: Terpolymer System with Common Monomers** (p. 62)
- **3.6 Spinodal Curve from B Values and EOS** (p. 65)
- **3.7 Copolymer/Homopolymer Blends of AMS-AN/PVC** (p. 67)
- **3.8 Copolymer/Homopolymer Blends of AMS-AN with Other Copolymers** (p. 68)
- **3.9 Intramolecular Repulsion as Driving Force for Miscibility-Mean Field Approach** (p. 75)
- **3.10 Summary** (p. 80)
- **Exercises** (p. 81)
- **Problems** (p. 82)
- **References** (p. 85)
- **Chapter 4 Keesom Forces and Group Solubility Parameter Approach** (p. 87)
- **Learning Objectives** (p. 87)
- **4.1 Hildebrandt Solubility Parameter** (p. 87)
- **4.2 Hansen Three-Dimensional Solubility Parameter** (p. 89)
- **4.3 Specific Interactions** (p. 89)
- **4.3.1 Experimental Determination of Equilibrium Rate Constants** (p. 94)
- **4.3.2 Phase Behavior of Miscible Blends with Keesom Interactions** (p. 95)
- **4.4 Summary** (p. 98)
- **Exercises** (p. 99)
- **Review Questions** (p. 103)
- **References** (p. 104)
- **Chapter 5 Phase Behavior** (p. 105)
- **Learning Objectives** (p. 105)
- **5.1 Introduction** (p. 105)
- **5.2 LCST and UCST** (p. 108)
- **5.2.1 Case I LCST** (p. 108)
- **5.3 Circular Envelope in Phase Diagram** (p. 110)
- **5.3.1 Case III Circular Phase Envelope UCST and LCST** (p. 110)
- **5.3.2 Case IV Circular Phase Envelope LCST and UCST** (p. 110)
- **5.4 Hourglass Behavior in Phase Diagrams** (p. 114)
- **5.4.1 Case V LCST and UCST Hourglass Behavior** (p. 114)
- **5.5 Molecular Architecture** (p. 116)
- **5.6 Summary** (p. 119)
- **Exercises** (p. 120)
- **References** (p. 122)
- **Chapter 6 Partially Miscible Blends** (p. 123)
- **Learning Objectives** (p. 123)
- **6.1 Commercial Blends That Are Partially Miscible** (p. 124)
- **6.2 Entropy Difference Model (ΔS_m)** (p. 124)
- **6.3 Estimates of Change in Entropy of Mixing at Glass Transition, ΔS_m** (p. 129)

- **3.5 Compositional Window of Miscibility: Terpolymer and Homopolymer System without Common Monomers** (p. 64)
- **5.2.2 Case II UCST** (p. 108)
- **Problems** (p. 121)
- **6.4 Copolymer and Homopolymer Blend** (p. 131)
- **6.5 Sequence Distribution Effects on Miscibility** (p. 134)
- **6.6 Summary** (p. 137)
- **Nomenclature** (p. 138)
- **Subscripts** (p. 139)
- **Superscripts** (p. 139)
- **Greek** (p. 139)
- **Exercises** (p. 139)
- **References** (p. 140)
- **Chapter 7 Polymer Nanocomposites** (p. 143)
- **Learning Objectives** (p. 143)
- **7.1 Introduction** (p. 143)
- **7.2 Commercial Products** (p. 143)
- **7.3 Thermodynamic Stability** (p. 144)
- **7.4 Vision and Realities** (p. 145)
- **7.5 Fullerenes** (p. 145)
- **7.6 Carbon Nanotubes (CNTs)** (p. 147)
- **7.7 Morphology of CNTs** (p. 148)
- **7.8 Nanostructuring Operations** (p. 151)
- **7.9 Polymer Thin Films** (p. 153)
- **7.10 Nanostructuring from Self-Assembly of Block Copolymers** (p. 154)
- **7.11 Intercalated and Exfoliated Nanocomposites** (p. 155)
- **7.12 Summary** (p. 162)
- **Exercises** (p. 163)
- **References** (p. 165)
- **Chapter 8 Polymer Alloys** (p. 167)
- **Learning Objectives** (p. 167)
- **8.1 Introduction** (p. 167)
- **8.2 PC/ABS Alloys** (p. 168)
- **8.3 Nylon/ABS Alloys** (p. 170)
- **8.4 PVC Alloys** (p. 171)
- **8.5 Polyolefin Alloys** (p. 173)
- **8.6 Natural Polymer Alloy** (p. 174)
- **8.7 Summary** (p. 176)
- **Exercises** (p. 177)
- **References** (p. 177)
- **Chapter 9 Binary Diffusion in Polymer Blends** (p. 179)
- **Learning Objectives** (p. 179)
- **9.1 Introduction** (p. 179)
- **9.2 Diffusion Phenomena** (p. 180)
- **9.4 Skylab Diffusion Demonstration Experiments** (p. 183)
- **9.5 Bulk Motion, Molecular Motion, and Total Molar Flux** (p. 184)

- **9.6.1 Diffusion in Concentrated Solutions** (p. 190)
- **9.7.1 Mechanisms of Diffusion** (p. 191)
- **9.7.2 Diffusion in Porous Solids** (p. 193)
- **9.8 Diffusion Coefficients in Polymers** (p. 194)
- **9.3 Fick's First and Second Laws of Diffusion** (p. 181)
- **9.6 Stokes-Einstein Equation for Dilute Solutions** (p. 186)
- **9.7 Diffusion in Solids** (p. 191)
- **9.9 Transient Diffusion** (p. 195)
- **9.9.1 Fick Molecular Diffusion-Semi-Infinite Medium** (p. 196)
- **9.10 Damped Wave Diffusion and Relaxation** (p. 198)
- **9.11 Periodic Boundary Condition** (p. 205)
- **9.12 Summary** (p. 208)
- **Problems** (p. 209)
- **Review Questions** (p. 215)
- **References** (p. 216)
- **Chapter 10 Copolymer Composition** (p. 219)
- **11.3.4 O(n) Space Solution by Dynamic Array** (p. 266)
- **Learning Objectives** (p. 219)
- **Problems** (p. 239)
- **10.1 Introduction** (p. 219)
- **10.5 Multicomponent Copolymerization-n Monomers** (p. 229)
- **References** (p. 241)
- **10.2 Composition for Random Copolymers** (p. 221)
- **11.3.1 Global Alignment of a Pair of Sequences** (p. 261)
- **11.3.2 Dynamic Programming** (p. 265)
- **10.3 Composition of Random Terpolymers** (p. 224)
- **Review Questions** (p. 240)
- **11.2 Dyad and Triad Probabilities in Terpolymers** (p. 249)
- **10.4 Reactivity Ratios** (p. 227)
- **11.3.1.1 Algorithm 1 Global Alignment** (p. 262)
- **10.6 Summary** (p. 239)
- **Chapter 11 Sequence Distribution of Copolymers** (p. 243)
- **Learning Objectives** (p. 243)
- **11.1 Dyad and Triad Probabilities in Copolymer** (p. 243)
- **11.3 Sequence Alignment in DNA and Protein Sequences** (p. 259)
- **11.3.3 Analysis of Time and Space Efficiency** (p. 266)
- **11.3.5 Subquadratic Algorithms for Longest Common Subsequence** (p. 266)
- **11.3.5.1 Algorithm 2: Length of Longest Increasing Subsequence** (p. 267)
- **11.3.5.2 Algorithm 3: Find and Print the Longest Common Subsequence of S and T** (p. 267)
- **11.3.6 Greedy Algorithms for Pairwise Alignment** (p. 268)
- **11.3.6.1 Algorithm 4: Tool for Aligning Very Similar DNA Sequences** (p. 269)
- **11.3.7 Other Methods for Pairwise Alignment** (p. 271)
- **11.3.8 Grading Functions during Global Alignment** (p. 271)
- **11.4 Summary** (p. 274)
- **Problems** (p. 275)

- **Review Questions** (p. 282)
- **References** (p. 283)
- **Chapter 12 Reversible Polymerization** (p. 285)
- **Learning Objectives** (p. 285)
- **12.1 Heat Effects during Polymerization** (p. 286)
- **12.2 Ceiling Temperature during Reversible Polymerization** (p. 290)
- **12.3 Subcritical Oscillations during Thermal Polymerization** (p. 294)
- **12.3.1 Thermal Initiation by Diels-Alder Dimerization** (p. 295)
- **12.3.2 Four Reactions in a Circle** (p. 299)
- **12.3.3 General Case of n Reactions in Circle** (p. 300)
- **12.4 Thermal Terpolymerization of Alkylstyrene, Acrylonitrile, and Styrene** (p. 300)
- **12.4.1 Experimental** (p. 301)
- **12.4.2 Results** (p. 302)
- **12.5 Reversible Copolymerization** (p. 304)
- **12.5.1 Copolymer Composition** (p. 304)
- **12.5.2 Heat of Copolymerization** (p. 308)
- **12.6 Summary** (p. 309)
- **Problems** (p. 311)
- **Review Questions** (p. 313)
- **References** (p. 313)
- **Appendix A Maxwell's Relations** (p. 315)
- **Appendix B Five Laws of Thermodynamics** (p. 319)
- **Appendix C Glass Transition Temperature** (p. 331)
- **Appendix D Statistical Distributions** (p. 335)
- **Index** (p. 343)