# Contents

*Preface to the Second Edition*  
*Preface to the First Edition*  
*Acknowledgments*  

1 *Introduction*  
1.1 Some history  
1.2 Classification of fibers  
1.3 Stiff and strong fibers  
1.4 Terminology and units  
References  
Suggested reading  

2 *Fibers and fibrous products*  
2.1 Definitions  
2.2 Some important attributes of fibers  
2.3 Important fiber types  
2.4 General applications  
2.5 Health hazards  
References  
Suggested reading  

3 *Natural polymeric fibers*  
3.1 Structure and properties of polymers  
3.2 Natural polymeric fibers  
3.3 Applications of natural polymeric fibers  
References  
Suggested reading  

4 *Synthetic polymeric fibers*  
4.1 The age of synthetic polymeric fibers  
4.2 Processing  
4.3 Environmental effects on polymeric fibers  
4.4 Some important low modulus synthetic polymeric fibers  
4.5 Strong and stiff polymeric fibers  

Page numbers are not provided in the image. The table is incomplete and requires further content to be filled in.
4.6 Polymeric fibers with unusual characteristics 102
4.7 Applications of synthetic polymeric fibers 105
References 111
Suggested reading 113

5 Electrospun fibers 114
5.1 Basic process 114
5.2 Electrospinning for tissue engineering 116
5.3 Bead formation 118
5.4 Electrospun alumina nanofibers 119
5.5 Special features of electrospinning 119
5.6 Force spinning™ 121
References 121
Suggested reading 122

6 Metallic fibers 123
6.1 General characteristics of metals 123
6.2 Processing of metallic filaments 125
6.3 Microstructure and properties of metallic fibers 131
6.4 Applications 146
References 148
Suggested reading 149

7 Ceramic fibers 150
7.1 Some important ceramics 150
7.2 Creep in ceramics 154
7.3 Natural ceramic fibers 155
7.4 Synthetic ceramic fibers 157
7.5 Ceramic whiskers 191
7.6 Applications 193
References 195
Suggested reading 198

8 Glass fibers 199
8.1 Basic physics of optical communication 199
8.2 Fabrication 202
8.3 Chemical composition of glass fibers 214
8.4 Structure of silica-based glass 215
8.5 Properties of glass fiber 217
8.6 Photonic bandgap fibers (PBGFs) 221
8.7 Applications 225
References 228
Suggested reading 229
## Contents

### 9 Carbon fibers
- 9.1 Structure and properties of graphite 230
- 9.2 Processing of carbon fibers 232
- 9.3 Structure of carbon fibers 238
- 9.4 Properties of carbon fibers 241
- 9.5 High thermal conductivity carbon fibers 245
- 9.6 Hollow carbon fibers 247
- 9.7 Carbon nanotubes and carbon nanotube fibers 247
- 9.8 Hazards of carbon fibers 250
- 9.9 Applications of carbon fibers 250

Suggested reading 253

### 10 Experimental determination of fiber properties
- 10.1 Physical properties 254
- 10.2 Mechanical properties 261

References 272

### 11 Statistical treatment of fiber strength
- 11.1 Variability of fiber strength 274
- 11.2 Weibull statistics 275
- 11.3 Weibull distribution of fiber strength 277
- 11.4 Determination of Weibull parameters for a fiber 281
- 11.5 Fiber bundle strength 284

References 288

Suggested reading 288

Appendix: Some important units and conversion factors 289

Indexes
- Author index 292
- Subject index 299

Colour plate section appears between pages 144 and 145