

Contents

Preface	v
List of Contributors	xi
1. From Optical Glass to Photonic Glass	1
1.1 Introduction	1
1.2 Physical Fundamentals	2
1.3 Optical Glasses	6
1.4 Photonic Glasses	18
2. Structure and Properties of Amorphous Thin Films for Optical Data Storage	39
2.1 Amorphous Rare Earth-transition Metal (RE-TM) Alloy Thin Films	40
2.2 Amorphous Metallic and Chalcogenide Thin Films	53
2.3 Nonlinear Optical Amorphous Alloy Thin Films	64
3. New Developments in Optics and Spectroscopy of Rare Earth Ions Doped Glasses	77
3.1 Laser Spectroscopy of Nd^{3+} and Yb^{3+} High Doped Glasses	77
3.2 Nonlinear Luminescence of Rare-Earth (RE) Ions in Glasses	94
3.3 Super-luminescence of RE-doped Glass Fibers	110
4. Third-Order Optical Nonlinear Properties of Glasses	117
4.1 Measurement of Third-Order Optical Nonlinear Susceptibility of Glass	118
4.2 Optical Nonlinearity of Dielectric Glasses	123
4.3 Optical Nonlinearity of Organic-Inorganic Hybrid Glasses	131
4.4 Optical Nonlinearity of Nano-composite Glasses	137
4.5 Optical Limiting Effects	146

5. Second-Order Optical Nonlinear Properties of Glasses	153
5.1 Introduction	153
5.2 Second-Order Optical Nonlinearity in Silica Glasses	167
5.3 Second-Order Optical Nonlinearity in High Refractive Index Glasses	172
5.4 Applications	186
6. Glass Fibers for Optical Amplification	191
6.1 Brief Introduction of Optical Fiber Amplifier	191
6.2 Er ³⁺ -Doped Phosphate Glass Fiber Amplifiers	193
7. Glass Fibers for High Power Lasers	227
7.1 Introduction of Optical Fibers	227
7.2 Fabrication and Materials	234
7.3 High Power Lasers Based on Rare-Earth Ions Doped Fibers	239
7.4 High Power Pulsed Fiber Lasers	246
7.5 Recent Development and Applications of Fiber Lasers	254
8. Hybrid Organic-Inorganic Solid-State Dye Laser Glasses	261
8.1 Organic Dyes and Liquid Dye Lasers	262
8.2 Hybrid Solid-State Dye Laser Glasses and Preparation Techniques	264
8.3 Photostabilities and Photodegradation Mechanisms of Hybrid Solid-State Dye Laser Glasses	273
8.4 Hybrid Solid Dye Laser Glass Based on Energy Transfer Between Laser Dyes	281
8.5 Solid-State Dye Lasers and Parameter Optimization	285
8.6 DFB Laser Based on Sol-Gel Derived Organic-Inorganic Hybrid Thin Film Waveguides	290
8.7 Summary and Future Prospects	292
9. Optical Glass Waveguides	299
9.1 Principles of Optical Waveguides	300
9.2 Glass Waveguides Fabrication and Optical Properties	302
9.3 Organic/inorganic Hybrid Glass Waveguide Materials	310
9.4 Functional Glass Waveguide Devices	315
10. Glass Photosensitivity and Fiber Gratings	339
10.1 Glass Photosensitivity	340
10.2 Principles of Fiber Gratings	355
10.3 Fiber Grating Fabrications	361
10.4 Fiber Grating Applications	363

11. Glass Fibers for Photonic Crystals	375
11.1 Light Guidance in PCF	377
11.2 Fabrication	383
11.3 Properties of PCFs and Device Applications	386
11.4 Non-Silica Glasses for PCFs.....	400
12. Functional Microstructures in Glass Induced by a Femtosecond Laser	405
12.1 Introduction	405
12.2 Micro-Structural Changes Induced by Femtosecond Lasers.....	407
12.3 Valence State Manipulation of Active Ions	417
12.4 Precipitation of Functional Crystals	424
12.5 Novel Phenomena Induced by Femtosecond Lasers.....	435
Index	445