## **Contents**

1	Glass Structure	1
	1.1 Analytical Methods for Glass Structure	1
	1.2 Characteristics of the Short Range Order of the Glassy State	11
	1.3 Homogeneity and Inhomogeneity of Glassy Material Structure	12
	1.4 The Structural Model of Glassy Materials	14
2	Light Scattering in Glass	18
	2.1 Fundamentals of Light Scattering in Solids	18
	2.2 Rayleigh Scattering in Glasses	22
	2.3 Brillouin Scattering in Glasses	24
	2.4 Raman Scattering in Glasses	27
	2.5 Stimulated Light Scattering in Glasses	57
3	Eigen Absorption in Glass	62
	3.1 Valence Band Structure of Glasses	62
	3.2 Experimental Results of Ultra-Violet Absorption	
	and Reflection Spectra of Glasses	64
	3.3 Study of Infrared Eigen Absorption	
	and Multi-Phonon Absorption	68
	3.4 Calculation of the Eigen Absorption Wavelength of Glass	
	by the Optical Dispersion Data	72
	3.5 Calculation of Eigen Absorption Wavelength	
	by the Chemical Composition of Glasses	74
4	Refractive-Dispersion Properties of Glass	78
	4.1 Fundamentals of Optical Dispersion	78
	4.2 Refractive-Dispersion Properties of Non-Oxide Glasses	80
	4.3 Partial Dispersion of Inorganic Glasses	96
	4.4 External Field Effects on Optical Constants	
	of Inorganic Glasses	101
5	Nonlinear Optical Properties of Glass	111
	5.1 Nonlinear Optical Effects in Glass	111
	5.2 Measurement of the Nonlinear Refractive Index of Glasses	
	5.3 Frequency Dependence of the Nonlinear Refractive Index $n_2(E)$	
	and Laser Induced Damage Threshold in Glasses	123

6	ESR Spectroscopic Properties of Transition Elements in Glass	126
	6.1 Introduction	126
	6.2 Generation of ESR (Electron Spin Resonance)	127
	6.3 Analysis of ESR Spectra	129
	6.4 ESR of Transition Metal Ions	135
	6.5 ESR of Rare Earth Ions	143
7	Optical Spectroscopic Properties of Transition Elements in Glass	148
	7.1 Theoretical Fundamental of Spectroscopy	148
	7.2 Spectroscopic Properties of Transition Metal Ions in Glasses	159
	7.3 Spectroscopic Properties of Rare Earth Metal Ions in Glasses	176
	7.4 Spectroscopic Properties of Ac Family Ions in Glasses	200
8	Laser Properties of Transition Elements in Glass	204
	8.1 Laser Fundamentals	204
	8.2 Laser Glasses	
	8.3 Laser Performances	217
9	Optical and Spectroscopic Properties of Semiconductor	
9	Optical and Spectroscopic Properties of Semiconductor Micro-Crystallites in Glass	228
9	Micro-Crystallites in Glass	228
9	Micro-Crystallites in Glass	
9	Micro-Crystallites in Glass  9.1 Properties of Electronic Motion in Semiconductor Micro-Crystallites	228
9	Micro-Crystallites in Glass	
	Micro-Crystallites in Glass  9.1 Properties of Electronic Motion in Semiconductor Micro-Crystallites  9.2 Spectroscopy of CdS(Se) Micro-Crystallites in Glass	228 235
	Micro-Crystallites in Glass  9.1 Properties of Electronic Motion in Semiconductor Micro-Crystallites  9.2 Spectroscopy of CdS(Se) Micro-Crystallites in Glass  9.3 Spectroscopy of CuCl Micro-Crystallites in Glass	228 235
	Micro-Crystallites in Glass  9.1 Properties of Electronic Motion in Semiconductor Micro-Crystallites  9.2 Spectroscopy of CdS(Se) Micro-Crystallites in Glass  9.3 Spectroscopy of CuCl Micro-Crystallites in Glass  Optical, Magneto-Optical, and Optical Recording Properties of Glass Thin Films	228 235 245 253
	Micro-Crystallites in Glass  9.1 Properties of Electronic Motion in Semiconductor Micro-Crystallites  9.2 Spectroscopy of CdS(Se) Micro-Crystallites in Glass  9.3 Spectroscopy of CuCl Micro-Crystallites in Glass  Optical, Magneto-Optical, and Optical Recording Properties of Glass Thin Films  10.1 Introduction	228 235 245
	Micro-Crystallites in Glass  9.1 Properties of Electronic Motion in Semiconductor Micro-Crystallites  9.2 Spectroscopy of CdS(Se) Micro-Crystallites in Glass  9.3 Spectroscopy of CuCl Micro-Crystallites in Glass  Optical, Magneto-Optical, and Optical Recording Properties of Glass Thin Films  10.1 Introduction  10.2 Magneto-Optical Properties of Amorphous	228 235 245 253
	Micro-Crystallites in Glass  9.1 Properties of Electronic Motion in Semiconductor Micro-Crystallites  9.2 Spectroscopy of CdS(Se) Micro-Crystallites in Glass  9.3 Spectroscopy of CuCl Micro-Crystallites in Glass  Optical, Magneto-Optical, and Optical Recording Properties of Glass Thin Films  10.1 Introduction  10.2 Magneto-Optical Properties of Amorphous TE-RE Alloy Films	228 235 245 253 253
	Micro-Crystallites in Glass  9.1 Properties of Electronic Motion in Semiconductor Micro-Crystallites  9.2 Spectroscopy of CdS(Se) Micro-Crystallites in Glass  9.3 Spectroscopy of CuCl Micro-Crystallites in Glass  Optical, Magneto-Optical, and Optical Recording Properties of Glass Thin Films  10.1 Introduction 10.2 Magneto-Optical Properties of Amorphous TE-RE Alloy Films  10.3 Optical and Recording Properties of Amorphous	228 235 245 253 253 254
	Micro-Crystallites in Glass  9.1 Properties of Electronic Motion in Semiconductor Micro-Crystallites  9.2 Spectroscopy of CdS(Se) Micro-Crystallites in Glass  9.3 Spectroscopy of CuCl Micro-Crystallites in Glass  Optical, Magneto-Optical, and Optical Recording Properties of Glass Thin Films  10.1 Introduction 10.2 Magneto-Optical Properties of Amorphous TE-RE Alloy Films  10.3 Optical and Recording Properties of Amorphous Semiconductor Films	228 235 245 253 253 254
	Micro-Crystallites in Glass  9.1 Properties of Electronic Motion in Semiconductor Micro-Crystallites  9.2 Spectroscopy of CdS(Se) Micro-Crystallites in Glass  9.3 Spectroscopy of CuCl Micro-Crystallites in Glass  Optical, Magneto-Optical, and Optical Recording Properties of Glass Thin Films  10.1 Introduction 10.2 Magneto-Optical Properties of Amorphous TE-RE Alloy Films  10.3 Optical and Recording Properties of Amorphous	228 235 245 253 253 254