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Nota di contenuto	Intro -- Preface -- Contents -- Contributors -- Abbreviations -- 1 Introduction -- 1.1 Nonlinearity -- 1.2 Classical Model of Nonlinear Optical Process -- 1.3 Pragmatic Importance of Nonlinear Spectroscopy for Materials Science -- 1.4 Synopsys -- Bibliography -- 2 Linear X-Ray Spectroscopy -- 2.1 Basics -- 2.1.1 Optical Responses of Materials in the X-Ray Region -- 2.1.2 X-Ray Sources -- 2.1.3 Light-Matter Interactions -- 2.2 X-Ray Spectroscopy -- 2.2.1 X-Ray Absorption Spectroscopy -- 2.2.2 Photoelectron Spectroscopy -- 2.2.3 X-Ray Emission Spectroscopy -- 2.3 Time-Resolved X-Ray Spectroscopy -- 2.3.1 Measurement Principles -- 2.3.2 Examples of Time-Resolved Photoemission Spectroscopy Measurement -- 2.4 Researcher's Guide to Material Characterization with X-Rays -- 2.4.1 The Guiding Chart for Experiments -- 2.4.2 Application for Beamtime at the X-Ray Facility -- 2.5 Summary -- References -- 3 Probing Nonlinear Light-Matter Interaction in Momentum Space: Coherent Multiphoton Photoemission

Spectroscopy -- 3.1 Introduction -- 3.2 Experimental Setup -- 3.2.1 Experimental Setup: The Photoelectron Analyzer -- 3.2.2 Experimental Setup: The Light-Source -- 3.3 mPP: Highly Nonlinear Mapping of the Energy- and Momentum-Dispersive Electronic Band Structure -- 3.3.1 Static mPP in Threshold Order of Photoemission -- 3.3.2 Above Threshold Photoemission -- 3.3.3 Toward Full Surface Brillouin Zone Mapping by Coherent mPP -- 3.4 Coherent Two-Dimensional Photoelectron Spectroscopy -- 3.4.1 Coherent 2D FT Photoelectron Spectroscopy-Optical Bloch Equation Modeling -- 3.4.2 Coherent 2D FT Photoelectron Spectroscopy of Ag(111) -- 3.4.3 Coherent Above Threshold Photoemission -- 3.5 Ultrafast Quasiparticle Dressing by Light -- 3.6 Conclusion -- References -- 4 Nonlinear Soft X-Ray Spectroscopy -- 4.1 Nonlinear Spectroscopy-Development with Visible Light.
4.2 Ultrafast X-Ray Light Sources -- 4.3 Family of Soft X-Ray Nonlinear Spectroscopy -- 4.4 Nonlinear Soft X-Ray Optics and Spectroscopies -- 4.4.1 Multiphoton Absorption -- 4.4.2 Stimulated Emission/Forward Scattering -- 4.4.3 Stimulated Raman Scattering -- 4.4.4 Four Wave Mixing -- 4.4.5 Soft X-Ray Second Harmonic Generation/Sum Frequency Generation -- 4.5 Theoretical Calculations for the Spectral Analysis -- 4.6 Summary -- References -- 5 Nonlinear X-Ray Spectroscopy -- 5.1 Introduction -- 5.2 The Basic Theory of Nonlinear Optics in the Hard X-Ray Region -- 5.2.1 Nonlinear Polarizability -- 5.2.2 X-Ray Second Harmonic Generation -- 5.2.3 Parametric Down-Conversion -- 5.2.4 Sum Frequency Generation -- 5.3 Featuring Examples of Nonlinear X-Ray Spectroscopy -- 5.3.1 X-Ray Two-Photon Absorption Spectroscopy -- 5.3.2 Saturable Absorption -- 5.3.3 Atomic X-Ray Laser -- 5.3.4 Stimulated X-Ray Emission Spectroscopy -- 5.3.5 X-Ray Transient Grating Spectroscopy -- 5.4 Summary -- References -- 6 Future Prospects -- 6.1 Toward Multi-dimensional Spectroscopy -- 6.2 Phase Sensitive Spectroscopy -- 6.3 Vacuum Nonlinear X-Ray Optics -- 6.4 Developments in Experimental Stations for Materials Science -- 6.5 Into the Deep: Nonlinear Science -- References -- Index.

Sommario/riassunto

X-ray experiments have been used widely in materials science, and conventional spectroscopy has been based on linear responses in light–matter interactions. Recent development of ultrafast light sources of tabletop lasers and X-ray free electron lasers reveals nonlinear optical phenomena in the X-ray region, and the measurement signals have been found to carry a further wealth of information on materials. This book overviews such nonlinear X-ray spectroscopy and its related issues for materials science. Each chapter is written by pioneers in the field and skillfully reviews the topics of nonlinear spectroscopy including X-ray multi-photon absorption and X-ray second harmonic generation. The chapters are divided depending on photon wavelength, ranging from extreme ultraviolet to (soft) X-ray. To facilitate readers' comprehensive understanding, some of the chapters cover the conventional linear X-ray spectroscopy and basic principles of the non-linear responses. The book is mainly accessible as a primer for junior/senior- or graduate-level readers, and it also serves as a useful reference or guide even for established researchers in optical spectroscopy. The book offers readers opportunities to benefit from cutting-edge research in this new area of nonlinear X-ray spectroscopy.