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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 nonlinear 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.