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Autore	Matsuda Iwao
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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 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.