

Ultrafast Lasers Technology And Applications

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intensities exceeding the internal electric field in atoms and molecules ($E=5 \times 10^9$ V/cm or

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intensity $I = 3 \dots$

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ultrafast lasers technology and applications

ultrafast lasers and their applications is called ultrafast laser physics and ultrafast optics it deals with all kinds of effects occurring in these lasers but also with phenomena which can be investigated using ultrashort laser pulses examples of such application areas are high intensity physics high harmonic generation frequency metrology laser

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Ultrashort laser pulses with durations in the femtosecond range up to a few picoseconds provide a unique method for precise materials processing or medical applications. Paired with the recent developments in ultrashort pulse lasers, this technology is finding its way into various application fields. The book gives a comprehensive overview of the principles and applications of ultrashort pulse lasers, especially applied to medicine and production technology.

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applications and future trends in various scientific and ultrafast lasers technology and applications topics include micromachining applications for metals dielectrics and biological tissue advanced electronics and semiconductor processing optical coherence tomography multiphoton microscopy optical sampling and scanning thz generation

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Covering high-energy ultrafast amplifiers and solid-state, fiber, and diode lasers, this reference examines recent developments in high-speed laser technology. It presents a comprehensive survey of ultrafast laser technology, its applications, and future trends in various scientific and industrial areas. Topics include: micromachining applications

This book describes the application of ultrafast laser science and technology in materials and processing relevant to industry today, including ultrafast laser ablation where fundamental studies have led to the development of the world's first femtosecond photomask repair tool. Semiconductor manufacturing companies worldwide use the tool to repair photomask defects, saving hundreds of millions in production costs. The most up-to-date ultrafast laser technologies are described and methods to generate high harmonics for photoelectron spectroscopy of industrially important materials are covered, with an emphasis on practical laboratory implementation. Basic device physics merged with photoemission studies from single- and polycrystalline materials are described. Extensions to new methods for extracting key device properties of metal-oxide-semiconductor structures, including band offsets, effective work functions, semiconductor band bending and defect-related charging in a number of technologically important gate oxides are detailed. Polycrystalline photovoltaic materials and heterostructures as well as organic light emitting materials are covered. This book describes both the history, and most recent applications of ultrafast laser science to industrially relevant materials, processes and devices.

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Ultrashort laser pulses with durations in the femtosecond range up to a few picoseconds provide a unique method for precise materials processing or medical applications. Paired with the recent developments in ultrashort pulse lasers, this technology is finding its way into various application fields. The book gives a comprehensive overview of the principles and applications of ultrashort pulse lasers, especially applied to medicine and production technology. Recent advances in laser technology are discussed in detail. This covers the development of reliable and cheap low power laser sources as well as high average power ultrashort pulse lasers for large scale manufacturing. The fundamentals of laser-matter-interaction as well as processing strategies and the required system technology are discussed for these laser sources with respect to precise materials processing. Finally, different applications within medicine, measurement technology or materials processing are highlighted.

Emerging Laser Technologies for High-Power and Ultrafast Science includes chapters from leading experts devoted to the most recent achievements in the field. Including cutting-edge topics such as high energy/high average power laser systems, the most current developments for high repetition rate high average power infrared fiber laser systems, breakthroughs of the development of CPA based on chromium doped zinc selenide gain material, infrared/mid-infrared laser systems based on high average power Ytterbium pumped OPCPA, and generation of ultrashort laser pulses in the UV spectral range. This book will serve as an important reference for students, researchers, scientists, and engineers interested in the development of next generation of ultrafast laser technologies.

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The laser has revolutionized many areas of science and society, providing bright and versatile light sources that transform the ways we investigate science and enables trillions of dollars of commerce. Now a second laser revolution is underway with pulsed petawatt-class lasers (1 petawatt: 1 million billion watts) that deliver nearly 100 times the total world's power concentrated into a pulse that lasts less than one-trillionth of a second. Such light sources create unique, extreme laboratory conditions that can accelerate and collide intense beams of elementary particles, drive nuclear reactions, heat matter to conditions found in stars, or even create matter out of the empty vacuum. These powerful lasers came largely from U.S. engineering, and the science and technology opportunities they enable were discussed in several previous National Academies' reports. Based on these advances, the principal research funding agencies in Europe and Asia began in the last decade to invest heavily in new facilities that will employ these high-intensity lasers for fundamental and applied science. No similar programs exist in the United States. Opportunities in Intense Ultrafast Lasers assesses the opportunities and recommends a path forward for possible U.S. investments in this area of science.

Ultrashort Laser Pulse Phenomena, Second Edition serves as an introduction to the phenomena of ultra short laser pulses and describes how this technology can be used to examine problems in areas such as electromagnetism, optics, and quantum mechanics.

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Ultrashort Laser Pulse Phenomena combines theoretical backgrounds and experimental techniques and will serve as a manual on designing and constructing femtosecond ("faster than electronics") systems or experiments from scratch. Beyond the simple optical system, the various sources of ultrashort pulses are presented, again with emphasis on the basic concepts and how they apply to the design of particular sources (dye lasers, solid state lasers, semiconductor lasers, fiber lasers, and sources based on frequency conversion). Provides an easy to follow guide through "faster than electronics" probing and detection methods THE manual on designing and constructing femtosecond systems and experiments Discusses essential technology for applications in micro-machining, femtochemistry, and medical imaging

Recent rapid advances in femtosecond technology have had a great impact on their industrial applications such as: ultrafast optoelectronic devices and optical telecommunication systems, ultrashort-pulse lasers and measurement systems, and the development of novel materials for ultrafast functions. In this book, a wealth of knowledge covering requirements in applications details of recent achievements in important technical areas is presented by world-prominent authors in a concise, systematic form. As a whole, this is the first comprehensive book on the emerging field of femtosecond technology.

This smooth introduction for advanced undergraduates starts with the fundamentals of lasers and pulsed optics. Thus prepared, the student is introduced to short and ultrashort laser pulses, and learns how to generate, manipulate, and measure them. Spectroscopic implications are also discussed. The second edition has been completely revised and includes

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two new chapters on some of the most promising and fast-developing applications in ultrafast phenomena: coherent control and attosecond pulses.

This book describes the application of ultrafast laser science and technology in materials and processing relevant to industry today, including ultrafast laser ablation where fundamental studies have led to the development of the world's first femtosecond photomask repair tool. Semiconductor manufacturing companies worldwide use the tool to repair photomask defects, saving hundreds of millions in production costs. The most up-to-date ultrafast laser technologies are described and methods to generate high harmonics for photoelectron spectroscopy of industrially important materials are covered, with an emphasis on practical laboratory implementation. Basic device physics merged with photoemission studies from single- and polycrystalline materials are described. Extensions to new methods for extracting key device properties of metal-oxide-semiconductor structures, including band offsets, effective work functions, semiconductor band bending and defect-related charging in a number of technologically important gate oxides are detailed. Polycrystalline photovoltaic materials and heterostructures as well as organic light emitting materials are covered. This book describes both the history, and most recent applications of ultrafast laser science to industrially relevant materials, processes and devices."

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