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Laser Ablation Pulsed Laser Ablation of Solids Laser Ablation of Electronic Materials Practical Applications of Laser Ablation Laser Ablation and Its Applications Pulsed Laser Ablation Ultrashort Pulse Laser Ablation of Bulk Materials Using Shaped Laser Beams Laser Ablation Laser Ablation Laser Ablation in Liquids Laser Ablation and Desorption Laser Ablation Advances in Laser Ablation of Materials Laser ablation Image-guided Laser Ablation High-Power Laser Ablation VII Laser Ablation Applications of Laser Ablation Laser ablation Atmospheric Pressure Plasma-Assisted Laser Ablation of Optical Glasses Laser Ablation of Molecular Substrates Laser Ablation Laser Ablation Laser Ablation Laser ablation of biological tissue Laser Ablation Laser Ablation Laser Ablation of Polymers Studied by Time Resolved Methods Phase Transformations and Ablation in Laser-Treated Solids Laser Ablation: Mechanisms and Applications--II. Laser Ablation Laser Ablation of Aqueous Samples at 193-nm Efficient material laser beam ablation with a picosecond laser Laser Ablation of Superconductors Resonant-infrared Laser Ablation of Polymers Recent Advances in Laser Ablation ICP-MS for Archaeology Fundamental Mechanisms of Pulsed Laser Ablation of Biological Tissue Time Resolved Force and Imaging Study on the Laser Ablation of Liquids Laser Ablation of Graphite in Different Buffer Gases Femtosecond Laser Ablation of Solid Materials

Efficient material laser beam ablation with a picosecond laser Jul 28 2020 Ultra-short pulse laser processing of ultra-hard materials requires an accurate and agile experimental and analytical investigation to determine an efficient choice of parameters and settings to optimize ablation. Therefore, this work presents a quality-oriented experimental approach and an analytical approach for the modeling and validation of multi-pulse picosecond laser beam ablation on cemented tungsten carbide. This work starts with a review of literature and state-of-the-art theories of four relevant areas for this research: picosecond lasers, laser beam ablation process, cemented tungsten carbide (WC) and quality-oriented tools. Subsequently, a concept for an efficient material laser beam ablation with a picosecond laser was introduced. Furthermore, two approaches for the investigation are presented from an experimental and analytical perspective, respectively. The first approach introduced a methodology for the identification of influential parameters. It executes a quality-oriented methodology based on the SWOT analysis, cause-and-effect diagram and the variable search methodology. The conclusion of the methodology gave the interaction of pulse repetition rate and scanner speed in the form of pulse overlap and track overlap PO/TO as the most influential parameter in the maximization of the ablation rate. The second most influential factors resulted laser beam power and burst-mode. The second approach, description of the model, executes a theoretical analysis of the picosecond laser beam ablation of cemented WC by the application of the Beer-Lambert law and multi-pulse ablation modeling. The unavailable material properties were obtained by experimental investigations, like in the cases of the incubation factor and the reflectivity factor. Threshold fluence for cemented WC was determined by the application of the heat transfer theory and input power intensity was adapted to a Gaussian beam profile. At the end of the approach, power density visualizations of a picosecond laser pulse under the five available pulse repetition rates were modeled and validated. The findings from the adaptation of the Beer-Lambert law acted as basis for development of the multi-pulse laser ablation model for both single-pulse mode and burst-mode, respectively. Based on the definition of the number of pulses N irradiating the same area, the corresponding threshold fluence for N, the input fluence and incubation factor, ablation depth was modeled and experimentally validated. Finally, results and conclusions of both approaches were discussed and a framework for an efficient laser beam ablation was presented. Recommendations for further actions on research and industry were introduced at the end of the work.

Laser Ablation of Graphite in Different Buffer Gases Jan 22 2020

Phase Transformations and Ablation in Laser-Treated Solids Dec 01 2020 Uses a unified standpoint to describe the principal physical processes that determine the possibility and practical effectiveness of utilizing lasers for the modification and ablation of solids. Analyzes the general mechanisms and laws operative in the course of laser treatment of various materials including metal alloys, rocks, oxides, high-temperature superconductors and hard biological tissues. The chapters on laser-induced solid state thermochemical reactions and phase transitions in high-temperature superconductors under laser radiation break new ground.

Ultrashort Pulse Laser Ablation of Bulk Materials Using Shaped Laser Beams Oct 23 2022 High precision, high quality, and high throughput of ultrashort pulse laser ablation of bulk material are the most demanded properties that are required to let this process technology compete with other micro-machining techniques. Previous attempts to increase volumetric ablation rates of ultrashort pulse laser processes were based on the increase of fluence or pulse repetition rates. They run into limitations mainly set by the occurrence of bumpy surfaces due to overheating of bulk material. In this work, the potential of laser beam shaping for the enhancement of ablation rates is studied systematically for the first time. The question regarding the physically shortest possible process time for ablation of 2.5D-structures by means of an ultrashort pulse laser is answered using a heat conduction model, which is extended by the ability to consider spatially shaped beams. The strategy of laser beam stamping is implemented in a novel optical setup and proven both theoretically and experimentally to have a great potential for increasing ablation rates.

Laser Ablation and Desorption Jun 19 2022 This volume introduces the subject of laser ablation and desorption to scientists and engineers. It covers fundamental experimental and theoretical tools, models, and techniques, and introduces the most important applications. Clearly written and organized in a straightforward manner, Laser Ablation and Desorption lead the reader straight through the fundamentals of laser-surface interactions. Each chapter is self-contained and includes references to other chapters as necessary, so that readers may begin with the topic of greatest interest and follow the references to other aspects of the subject contained within the book. Key Features * Provides up-to-date information about one of the most active fields in physics today * Written and edited by major figures in the field of laser ablation and desorption * Represents the most comprehensive treatment of the state-of-the-art available

Laser Ablation of Polymers Studied by Time Resolved Methods Jan 02 2021

Laser Ablation Apr 29 2023 Laser Ablation provides a broad picture of the current understanding of laser ablation and its many applications, from the views of key contributors to the field. Discussed are in detail the electronic processes in laser ablation of semiconductors and insulators, the post-ionization of laser-desorbed biomolecules, Fourier-transform mass spectroscopy, the interaction of laser radiation with organic polymers, laser ablation and optical surface damage, laser desorption/ablation with laser detection, and laser ablation of superconducting thin films.

Femtosecond Laser Ablation of Solid Materials Dec 21 2019

Laser Ablation Jul 08 2021 Laser ablation is an established and versatile tool in modern manufacturing. At the same time, the basics and applications of laser ablation are the subject of numerous current research studies. Both facts demonstrate a huge interest in the topic as well as the enormous potential of this technique for a number of applications, such as laser materials processing and laser-based materials testing. This book addresses scientists, researchers and application engineers who work in the continuously growing field of laser ablation. It also acts as a reference book for professors, lecturers and students of corresponding study courses or professional training programs. Written by an international board of authors, this book provides an overview on laser sources used for laser ablation, the basics of laser beam guidance and shaping as well as laser-matter-interactions and the main underlying mechanisms of laser ablation. Different laser-based material processing and modification methods along with specific applications and recent developments of laser ablation techniques are presented. Laser-plasma-hybrid techniques, the laser-based fabrication of

nanoparticles and heterostructures, and laser surface functionalisation are merely some of the methods aforementioned. Furthermore, several laser-induced effects are discussed against the background of relevant applications in microelectronics, photovoltaics, packaging and patterning.
Resonant-infrared Laser Ablation of Polymers May 26 2020
Laser Ablation and Its Applications Dec 25 2022 Laser ablation describes the interaction of intense optical fields with matter, in which atoms are selectively driven off by thermal or nonthermal mechanisms. This is the first book that combines the most recent results in this rapidly advancing field with authoritative treatment of laser ablation and its applications, including the physics of high-power laser-matter interaction.
Applications of Laser Ablation Nov 12 2021 Laser ablation refers to the phenomenon in which a low wavelength and short pulse (ns-fs) duration of laser beam irradiates the surface of a target to induce instant local vaporization of the target material generating a plasma plume consisting of photons, electrons, ions, atoms, molecules, clusters, and liquid or solid particles. This book covers various aspects of using laser ablation phenomenon for material processing including laser ablation applied for the deposition of thin films, for the synthesis of nanomaterials, and for the chemical compositional analysis and surface modification of materials. Through the 18 chapters written by experts from international scientific community, the reader will have access to the most recent research and development findings on laser ablation through original research studies and literature reviews.
Laser Ablation: Mechanisms and Applications--II. Oct 31 2020
Laser Ablation Jun 07 2021 Due to their unique flexibility and high reproducibility, lasers have been traditionally used in processes such as cutting, drilling, machining, welding or cladding. In recent years, with the development of ultrafast laser sources, (ie: laser sources emitting pulses with durations ranging from picoseconds to femtoseconds), lasers also emerged as a new and promising tool for the texturing of virtually all kinds of surfaces. In Chapter One, a brief overview of the lasers and techniques utilised in micro- and nano-surface modifications is presented, followed by a detailed discussion of the surface chemistry and topography effect on bacteria aggregation and adhesion. Also, the role of the laser-induced superficial patterns on the response and sensitivity of bio-implants will be explored in depth. Chapter Two reports on cardiovascular laser application by using the open-irrigated ELMA catheter RytmoLas as an intriguing alternative for catheter ablation of arrhythmias. Chapter Three describes a novel feature designed for ELAI in which different colouration codes for the different metals are applied, enabling a good regional allocation of a specific metal within the tissues. Chapter Four focuses on laser ablation processing of metallic and polymeric thin films used in microelectromechanical systems technology for the fabrication of microfluidic devices with integrated electrodes on printed circuit boards (PCB-MEMS). Chapter Five presents typical micro and nanotextured surfaces created by direct irradiation under stationary and non-stationary conditions and the mechanisms behind their development and growth are discussed. Chapter Six describes a novel three-dimensional (3-D) fabrication process of micro-scale shell resonator made of single-crystal diamond (SCD). Chapter Seven discusses the data about structural and morphological characteristics of nano-sized transition-metal oxides of zirconium and molybdenum produced by laser ablation in water.
Laser Ablation of Aqueous Samples at 193-nm Aug 29 2020
Advances in Laser Ablation of Materials Apr 17 2022
Laser ablation Mar 16 2022
Time Resolved Force and Imaging Study on the Laser Ablation of Liquids Feb 21 2020
Fundamental Mechanisms of Pulsed Laser Ablation of Biological Tissue Mar 24 2020
Laser Ablation Feb 03 2021
Laser Ablation in Liquids Jul 20 2022 This book focuses on the fundamental concepts and physical and chemical aspects of pulsed laser ablation of solid targets in liquid environments and its applications in the preparation of nanomaterials and fabrication of nanostructures. The areas of focus include basic thermodynamic and kinetic processes of laser ablation in liquids, and its applications in metal and metal oxides nanocrystals synthesis and semiconductor nanostructures fabrication. The book comprises theoretical and experimental analysis of laser ablation in liquids, research methods, and preparation techniques.
Laser ablation of biological tissue Apr 05 2021
Laser Ablation Mar 04 2021 Lasers can readily remove very thin layers from small areas of a material and can thus be used both to control the structure of the surface and to determine its composition. Laser ablation thus has a wide variety of applications - from re-shaping the cornea of the eye to correct vision and micro-machining electronic devices, to detection of minute contaminants on catalysts. This book is the proceedings of one ofthe first workshops held on this topic.
Laser Ablation of Electronic Materials Feb 27 2023 The contributions in this volume focus on the main directions that ablation has taken in recent years: basic mechanisms, diagnostics and applications to surface etching, materials synthesis and instrumentation.
Practical Applications of Laser Ablation Jan 26 2023 Laser ablation refers to the phenomenon in which an intense laser beam irradiates the surface of a solid to induce instant local removal of atoms by a thermal or non-thermal mechanism. Through eight chapters of original research studies and literature reviews written by experts from the international scientific community, this book presents theoretical and experimental aspects of the laser ablation phenomenon for processing material including pulsed laser deposition of thin films, laser surface modification, laser machining and laser nanoparticle formation. It also includes a study of the dynamics of plasmas generated by laser ablation of multi-component materials and an overview of laser-induced breakdown spectroscopy (LIBS) and laser ablation inductively coupled plasma mass spectrometry (LA-ICP-MS) techniques for chemical analysis.
Laser Ablation Aug 21 2022 Laser ablation is the process of removing material from a solid (or occasionally liquid) surface by irradiating it with a laser beam. At low laser flux, the material is heated by the absorbed laser energy and evaporates or sublimates. At high laser flux, the material is typically converted to a plasma. Usually, laser ablation refers to removing material with a pulsed laser, but it is possible to ablate material with a continuous wave laser beam if the laser intensity is high enough. This book presents current research in the study of laser ablation from across the globe. Topics discussed herein include double-pulse laser ablation of solid targets in ambient gas; using laser ablation ICP-MS and its potential in sampling archaeological skeletal materials; and numerical modelling of laser-matter interactions.
Laser Ablation May 18 2022 Shortly after the demonstration of the first laser, the most intensely studied theoretical topics dealt with laser-matter interactions. Many experiments were undertaken to clarify the major ablation mechanisms. At the same time, numerous theoretical studies, both analytical and numerical, were proposed to describe these interactions. These studies paved the ways toward the development of numerous laser applications, ranging from laser micro- and nanomachining to material analysis, nanoparticle and nanostructure formation, thin-film deposition, etc. Recently, more and more promising novel fields of laser applications have appeared, including biomedicine, catalysis, photovoltaic cells, etc. This book intends to provide the reader with a comprehensive overview of the current state of the art in laser ablation, from its fundamental mechanisms to novel applications.
Recent Advances in Laser Ablation ICP-MS for Archaeology Apr 24 2020 This book explores different aspects of LA-ICP-MS (laser ablation-inductively coupled plasma-mass spectrometry). It presents a large array of new analytical protocols for elemental or isotope analysis. LA-ICP-MS is a powerful tool that combines a sampling device able to remove very small quantities of material without leaving visible damage at the surface of an object. Furthermore, it functions as a sensitive analytical instrument that measures, within a few seconds, a wide range of isotopes in inorganic samples. Determining the elemental or the isotopic composition of ancient material is essential to address questions related to ancient technology or provenance and therefore aids archaeologists in reconstructing exchange networks for goods, people and ideas. Recent improvements of LA-ICP-MS have opened new avenues of research that are explored in this volume.
Laser Ablation of Superconductors Jun 26 2020

Laser Ablation Sep 22 2022
High-Power Laser Ablation VII Jan 14 2022 Includes Proceedings Vol. 7005
Pulsed Laser Ablation Nov 24 2022 Pulsed laser–based techniques for depositing and processing materials are an important area of modern experimental and theoretical scientific research and development, with promising, challenging opportunities in the fields of nanofabrication and nanostructuring. Understanding the interplay between deposition/processing conditions, laser parameters, as well as material properties and dimensionality is demanding for improved fundamental knowledge and novel applications. This book introduces and discusses the basic principles of pulsed laser–matter interaction, with a focus on its peculiarities and perspectives compared to other conventional techniques and state-of-the-art applications. The book starts with an overview of the growth topics, followed by a discussion of laser–matter interaction depending on laser pulse duration, background conditions, materials, and combination of materials and structures. The information outlines the foundation to introduce examples of laser nanostructuring/processing of materials, pointing out the importance of pulsed laser–based technologies in modern (nano)science. With respect to similar texts and monographs, the book offers a comprehensive review including bottom-up and top-down laser-induced processes for nanoparticles and nanomicrostructure generation. Theoretical models are discussed by correlation with advanced experimental protocols in order to account for the fundamentals and underline physical mechanisms of laser–matter interaction. Reputed, internationally recognized experts in the field have contributed to this book. In particular, this book is suitable for a reader (graduate students as well as postgraduates and more generally researchers) new to the subject of pulsed laser ablation in order to gain physical insight into and advanced knowledge of mechanisms and processes involved in any deposition/processing experiment based on pulsed laser–matter interaction. Since knowledge in the field is given step by step comprehensively, this book serves as a valid introduction to the field as well as a foundation for further specific readings.
Image-guided Laser Ablation Feb 15 2022 This book offers a comprehensive guide to the technical basis of laser ablation, describing and reporting in detail on the latest findings. The world of medicine is currently working to reduce the invasiveness of treatment, in order to improve patients' quality of life. Image-guided ablations are rapidly becoming an effective alternative to several surgical treatments. Among the many techniques available for ablation, laser is still not widely used, though its efficacy has been amply demonstrated. The scientific community is now showing a growing interest in laser techniques for image-guided ablations, and many physicians are willing to start using lasers in their clinical practice. The book is divided into 16 chapters, including historical notes, technical aspects, outcomes of ex-vivo experiments, and results of the application of this technique in various clinical scenarios. It will be of great interest to a broad range of physicians (interventional radiologists, surgeons, gastroenterologists, endocrinologists, urologists), from less experienced trainees to expert physicians who want to introduce a novel clinical practice.
Laser Ablation Sep 29 2020
Pulsed Laser Ablation of Solids Mar 28 2023 The book introduces 'the state of the art' of pulsed laser ablation and its applications. It is based on recent theoretical and experimental studies. The book reaches from the basics to advanced topics of pulsed laser ablation. Theoretical and experimental fundamental phenomena involved in pulsed laser ablation are discussed with respect to material properties, laser wavelength, fluence and intensity regime of the light absorbed linearly or non-linearly in the target material. The energy absorbed by the electrons leads to atom/molecule excitation, ionization and/or direct chemical bond breaking and is also transferred to the lattice leading to material heating and phase transitions. Experimental non-invasive optical methods for analyzing these phenomena in real time are described. Theoretical models for pulsed laser ablation and phase transitions induced by laser beams and laser-vapour/plasma interaction during the plume expansion above the target are also presented. Calculations of the ablation speed and dimensions of the ablated micro- and nano-structures are performed. The validity and required refinement of different models in different experimental conditions is provided. The pulsed laser deposition process which bases on collecting the ablated particles on a surface is analyzed in terms of efficiency and quality of the deposited films as a function of ambient conditions, target material, laser parameters and substrate characteristics. The interaction between the incident laser and the ablation plasma is analyzed with respect to its influence on the structures of the deposited films and its capacity to generate high harmonics and single attosecond pulses which are highly desirable in pump-probe experiments.
Atmospheric Pressure Plasma-Assisted Laser Ablation of Optical Glasses Sep 10 2021 In the present work, two different approaches for atmospheric pressure plasma-assisted ablation of optical glasses were investigated. For sequential plasma-assisted ablation, the glasses were plasma pre-treated prior to laser ablation. Here, a hydrogenous process gas was applied in order to initiate a plasma-chemical surface modification. It was shown that relevant optical properties and in particular the transmission characteristics of the investigated glasses were modified as a result of such pre-treatment. Several underlying mechanisms were determined: (i) the formation of suboxide layers close to the glass surface, (ii) the implantation of hydrogen into deeper regions of the glass bulk material and (iii) surface roughening due to the plasma pre-treatment. As a result, an enhanced coupling of incoming laser irradiation during subsequent ablation was achieved. This effect allowed a significant reduction of the laser ablation threshold as well as an improved machining quality, i.e. a higher contour accuracy and a reduced surface roughness of the ablated area. For simultaneous plasma-assisted ablation, the laser beam was guided coaxially to an argon plasma beam in order to benefit from plasmaphysical interactions. Due to an additional energy transfer by the plasma during ablation, the ablation rate was notably increased. It was further shown that the plasma beam used for this simultaneous process effects the smoothing of rough optical glass surfaces. The combination of the investigated approaches thus allows providing a novel integrated plasma-assisted ablation process for the micro structuring of optical devices of high quality.
Laser Ablation Dec 13 2021
Laser Ablation May 06 2021 This book contains the proceedings of the largest conference ever held on this subject. The strong interest in this field is largely due to the fact that both fundamental aspects of laser-surface interaction as well as applied techniques for thin film generation and patterning were treated in detail by experts from around the world.
Laser ablation Oct 11 2021
Laser Ablation of Molecular Substrates Aug 09 2021

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