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SPRINGER SERIES IN MATERIALS SCIENCE 109

Reactive Sputter Deposition

 Springer

Reactive Sputter Deposition Springer Series In Materials Science

Francisco L. Tabarés



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Reactive Sputter Deposition Diederik Depla, Stijn Mahieu, 2008-06-24 The most straightforward method to change the surface properties of a material is to deposit a thin film or coating on it. Hence it is not surprising that an overwhelming amount of scientific and technical papers is published each year on this topic. Sputter deposition is one of the many so-called physical vapour deposition (PVD) techniques. In most cases, sputter deposition uses a magnetically enhanced glow discharge or magnetron discharge to produce the ions which bombard and sputter the cathode material. In the first chapter of this book (Chap 1) the details of the sputter process are discussed. Essential to sustain the discharge is the electron emission during ion bombardment. Indeed, the emitted electrons are accelerated from the target and can ionize gas atoms. The formed ions bombard again the target, completing the sustaining process. A complete chapter is assigned to this process to highlight its importance. Chap 2 Although the sustaining process can be described quite straightforward, a complete understanding of the magnetron discharge and the influence of different parameters on the discharge characteristics is only possible by modelling (see Chap 3). With these three chapters, the reader should be able to form an idea of the target and plasma processes occurring during a DC magnetron discharge.

Thin Films Dongfang Yang, Katherine Gibson, 2023-03-29 A thin film is a layer of material ranging from fractions of a nanometer to several micrometers in thickness. Thin films have been employed in many applications to provide surfaces that possess specific optical, electronic, chemical, mechanical, and thermal properties. Through ten chapters consisting of original research studies and literature reviews written by experts from the international scientific community, this book covers the deposition and application of thin films.

High Power Impulse Magnetron Sputtering Daniel Lundin, Tiberiu Minea, Jon Tomas Gudmundsson, 2019-08-28 High Power Impulse Magnetron Sputtering: Fundamentals, Technologies, Challenges, and Applications is an in-depth introduction to HiPIMS that emphasizes how this novel sputtering technique differs from conventional magnetron processes in terms of both discharge physics and the resulting thin film characteristics. Ionization of sputtered atoms is discussed in detail for various target materials. In addition, the role of self-sputtering, secondary electron emission, and the importance of controlling the process gas dynamics (both inert and reactive gases) are examined in detail with an aim to generate stable HiPIMS processes. Lastly, the book also looks at how to characterize the HiPIMS discharge, including essential diagnostic equipment. Experimental results and simulations based on industrially relevant material systems are used to illustrate mechanisms controlling nucleation, kinetics, column formation, and microstructure evolution. Includes a comprehensive description of the HiPIMS process from fundamental physics to applications. Provides a distinctive link between the process, plasma, and thin film communities. Discusses the industrialization of HiPIMS and its real-world applications.

Plasma Applications for Material Modification Francisco L. Tabarés, 2021-09-23 This book is an up-to-date review of the most important plasma-based techniques for material modification from microelectronics to biological materials and from fusion plasmas to atmospheric ones. Each of its technical chapters is written

by long experienced internationally recognised researchers The book provides a deep and comprehensive insight into plasma technology and its associated elemental processes and is illustrated throughout with excellent figures and references to complement each section Although some of the topics covered can be traced back several decades care has been taken to emphasize the most recent findings and expected evolution The first time the word plasma appeared in print in a scientific text related to the study of electrical discharges in gases was 1928 when Irving Langmuir published his article Oscillations in Ionized Gases It was the baptism of the predominant state of matter in the known universe it is estimated that up to 99% of matter is plasma although not on earth where the conditions of pressure and temperature make normal the states of matter solid liquid gas which in global terms are exotic It is enough to add energy to a solid in the form of heat or electromagnetic radiation to go into the liquid state from which gas is obtained through an additional supply of energy If we continue adding energy to the gas we will partially or totally ionise it and reach a new state of matter plasma made up of free electrons atoms and molecules electrically neutral particles and ions endowed with a positive or a negative electric charge

The Failure Mechanisms of Coated Precision Glass Molding Tools Kyriakos Georgiadis, 2015-10-19 Molding tools in precision glass

molding fail easily even with protective thin film coatings applied In this work various efficient methods for assessing glass coating interactions are developed including a new automated testing rig Analysis of the testing results provides a better understanding of these mechanisms and how they are influenced by material properties and process parameters so that the appropriate measures can be taken to prolong the life of the molding tools

Quantum Tunneling of Josephson Vortices in High-Impedance Long Junctions Wildermuth, Matthias Micha, 2023-09-11 In the last decades superconducting devices

have emerged as a promising platform for quantum technologies including quantum sensing and quantum computing Their key elements are Josephson junctions which allow for coherent supercurrent tunneling between two weakly linked superconductors If such a junction is extended in one direction to a long junction the superconducting phase difference can vary in space and time and may allow for quantized phase windings that drive supercurrent vortices

Green Nanotechnology Geoffrey B. Smith, Claes-Goran S. Granqvist, 2010-09-29 A first step in developing a clean and sustainable future is to think differently about everyday products in particular how they influence energy use Green Nanotechnology

Solutions for Sustainability and Energy in the Built Environment explores the science and technology of tiny structures that have a huge potential to improve quality of life wh

Nanotechnology in Eco-Efficient Construction Fernando

Pacheco-Torgal, Maria Vittoria Diamanti, Ali Nazari, Claes Goran-Granqvist, 2013-04-04 As the environmental impact of existing construction and building materials comes under increasing scrutiny the search for more eco efficient solutions has intensified Nanotechnology offers great potential in this area and is already being widely used to great success

Nanotechnology in eco efficient construction is an authoritative guide to the role of nanotechnology in the development of eco efficient construction materials and sustainable construction Following an introduction to the use of nanotechnology in

eco efficient construction materials part one considers such infrastructural applications as nanoengineered cement based materials nanoparticles for high performance and self sensing concrete and the use of nanotechnology to improve the bulk and surface properties of steel for structural applications Nanoclay modified asphalt mixtures and safety issues relating to nanomaterials for construction applications are also reviewed before part two goes on to discuss applications for building energy efficiency Topics explored include thin films and nanostructured coatings switchable glazing technology and third generation photovoltaic PV cells high performance thermal insulation materials and silica nanogel for energy efficient windows Finally photocatalytic applications are the focus of part three which investigates nanoparticles for pollution control self cleaning and photosterilisation and the role of nanotechnology in manufacturing paints and purifying water for eco efficient buildings Nanotechnology in eco efficient construction is a technical guide for all those involved in the design production and application of eco efficient construction materials including civil engineers materials scientists researchers and architects within any field of nanotechnology eco efficient materials or the construction industry Provides an authoritative guide to the role of nanotechnology in the development of eco efficient construction materials and sustainable construction Examines the use of nanotechnology in eco efficient construction materials Considers a range of important infrastructural applications before discussing applications for building energy efficiency

Nanostructured Surfaces and Thin Films Synthesis by Physical Vapor Deposition Rafael Alvarez, 2021-04-22 This Special Issue deals with the synthesis of nanostructured surfaces and thin films by means of physical vapor deposition techniques such as pulsed laser deposition magnetron sputtering HiPIMS or e beam evaporation among others The nanostructuring of the surface modifies the way a material interacts with the environment changing its optical mechanical electrical tribological or chemical properties This can be applied in the development of photovoltaic cells tribological coatings optofluidic sensors or biotechnology to name a few This issue includes research presenting novel or improved applications of nanostructured thin films such as photovoltaic solar cells thin film transistors antibacterial coatings or chemical and biological sensors while also studying the nanostructuring mechanisms from a fundamental point of view that produce rods columns helices or hexagonal grids at the nanoscale

The Theory of Laser Materials Processing John Dowden, 2009-01-06 The purpose of this book is to show how general principles afford insight into laser processes The principles may be from fundamental physical theory or from direct observation but understanding of the general characteristics of a process is essential

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