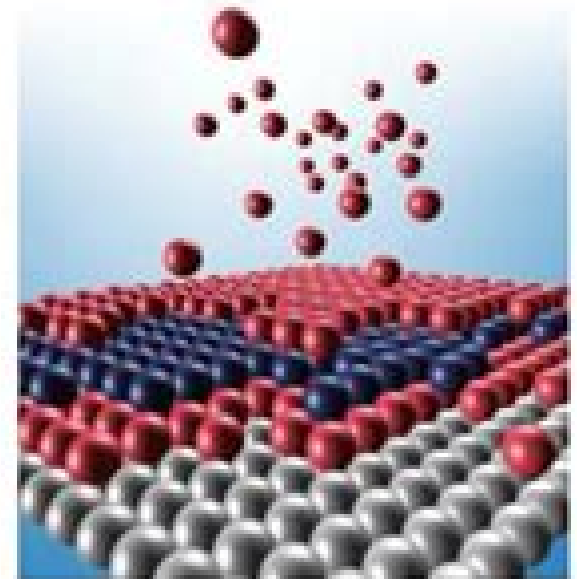


Atomic Layer Deposition - ALD

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Atomic Layer Deposition in Energy Conversion Applications Julien Bachmann, 2017-03-15 Combining the two topics for the first time this book begins with an introduction to the recent challenges in energy conversion devices from a materials preparation perspective and how they can be overcome by using atomic layer deposition ALD By bridging these subjects it helps ALD specialists to understand the requirements within the energy conversion field and researchers in energy conversion to become acquainted with the opportunities offered by ALD With its main focus on applications of ALD for photovoltaics electrochemical energy storage and photo and electrochemical devices this is important reading for materials scientists surface chemists electrochemists electrotechnicians physicists and those working in the semiconductor industry

Handbook of Thin Film Deposition Krishna Seshan, Dominic Schepis, 2018-02-23 Handbook of Thin Film Deposition Fourth Edition is a comprehensive reference focusing on thin film technologies and applications used in the semiconductor industry and the closely related areas of thin film deposition thin film micro properties photovoltaic solar energy applications materials for memory applications and methods for thin film optical processes The book is broken up into three sections scaling equipment and processing and applications In this newly revised edition the handbook will also explore the limits of thin film applications most notably as they relate to applications in manufacturing materials design and reliability Offers a practical survey of thin film technologies aimed at engineers and managers involved in all stages of the process design fabrication quality assurance applications and the limitations faced by those processes Covers core processes and applications in the semiconductor industry and new developments within the photovoltaic and optical thin film industries Features a new chapter discussing

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Atomic Layer Deposition (ALD) Jeannie Valdez, 2015 Atomic layer deposition ALD is a thin film deposition technique used in the mass production of microelectronics In this book novel nonvolatile memory devices are discussed The chapters examine the low temperature fabrication process of single crystal platinum non thin films using plasma enhanced atomic layer deposition PEALD A comprehensive review of ALD surface coatings for battery systems is provided as well as a theoretical calculation on the mechanism of thermal and plasma enhanced atomic layer deposition of SiO₂ and fluorine doping behavior in Zn based conducting oxide film grown by ALD

Handbook of Smart Materials, Technologies, and Devices Chaudhery Mustansar Hussain, Paolo Di Sia, 2022-11-09 This handbook brings together

technical expertise conceptual background applications and societal aspects of Industry 4.0 the evolution of automation and data exchange in fabrication technologies materials processing and device manufacturing at both experimental and theoretical model scales The book assembles all the aspects of Industry 4.0 starting from the emergence of the concept to the consequences of its progression Drawing on expert contributors from around the world the volume details the technologies that sparked the fourth revolution and illustrates their characteristics potential and methods of use in the industrial and societal domains In addition important topics such as ethics privacy and security are considered in a reality where all data is shared and saved remotely The collection of contributions serve a very broad audience working in the fields of science and engineering chemical engineering materials science nanotechnology energy environment green chemistry sustainability electrical and electronic engineering solid state physics surface science aerosol technology chemistry colloid science device engineering and computer technology This handbook ideal reference libraries in universities and industrial institutions government and independent institutes individual research groups and scientists

NASA Tech Briefs, 2008

Atomic Layer Deposition for Semiconductors Cheol Seong Hwang, 2013-10-18 Offering thorough coverage of atomic layer deposition ALD this book moves from basic chemistry of ALD and modeling of processes to examine ALD in memory logic devices and machines Reviews history operating principles and ALD processes for each device

Atomic Layer Deposition David Cameron, 2020-12-28 Atomic layer deposition ALD is a thin film deposition process renowned for its ability to produce layers with unrivaled control of thickness and composition conformability to extreme three dimensional structures and versatility in the materials it can produce These range from multi component compounds to elemental metals and structures with compositions that can be adjusted over the thickness of the film It has expanded from a small scale batch process to large scale production also including continuous processing known as spatial ALD It has matured into an industrial technology essential for many areas of materials science and engineering from microelectronics to corrosion protection Its attributes make it a key technology in studying new materials and structures over an enormous range of applications This Special Issue contains six research articles and one review article that illustrate the breadth of these applications from energy storage in batteries or supercapacitors to catalysis via x ray UV and visible optics

Atomic Layer Deposition Applications 3 Ana Londergan, 2007 The continuously expanding realm of Atomic Layer Deposition ALD Applications is the symposium focus ALD can enable the precise deposition of ultra thin highly conformal coatings over complex 3D topography with controlled composition and properties Following two successful years this symposium is well on its way to becoming a forum for the sharing of cutting edge research in the various areas where ALD is used

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Atomic Layer Deposition Applications S. de Gendt, 2009-09 Atomic Layer Deposition can enable precise deposition of ultra thin highly conformal coatings over complex 3D topography with controlled composition and properties for a wide range of applications

The Initial Stages of Atomic Layer Deposition on Substrates Modified by Organic Thin Films Kevin James Hughes, 2011 Atomic layer deposition ALD provides the ability to deposit highly conformal thin films with essentially molecular level control over film thickness These characteristics have made it an active area of research for a number of applications notably in the field of semiconductor devices The focus of the work presented here is on the initial stages of film growth including the first interaction of gas phase ALD precursors with the substrate and the period in which the growing surface transitions from the starting substrate to the steady state growing film Of particular interest are substrates modified using thin organic films These organic films are used to alter the identity density and spatial extent of functional groups on the surface We begin with a review of the prior work in this area focusing on the ALD of TiN_x on a variety of organic films including self assembled monolayers with various endgroup chemistries and branched films with a more 3 d distribution of functional groups Here connections are observed between the initial interactions of the gas phase precursors with the organic film and the subsequent stages of ALD growth A relationship between the initial rate of ALD growth and the resulting film morphology is also observed and can be explained by a variation in nucleation site density due to the structure of the organic film The next section involves the ALD of a range of materials Al_2O_3 HfO_2 Ta_2O_5 and TaN_x on a single organic layer branched poly ethylene imine PEI Here the presence of the organic layer causes an attenuation in the amount of material deposited per ALD cycle in the initial stages of growth A strong correlation was found between the thermodynamic driving force of the ALD reaction and the degree of attenuation suggesting that ALD processes in which there is a strong driving force or low activation energy for the formation of the final products can more easily overcome the obstacles presented by the organic layer The ALD of one material TaN_x was examined in more detail using in situ XPS Substrates in this study included nonporous SiO_2 a porous low dielectric constant or low κ material and both substrates modified by PEI films PEI was used here in part because of the tendency of smaller molecules to infiltrate and deposit within the pore network of the low κ The chemical structure of the chemisorbed tantalum precursor $\text{Ta}(\text{NCH}_3)_2$ after the first cycle of ALD as well as the oxidation state and chemical composition of the TaN_x film in the first 10 cycles were strongly affected by the starting

substrate Substrates with a high density of oxygen containing groups led to a more oxidized TaNx film and less efficient incorporation of N in a nitride binding state Furthermore the presence of a PEI film enhanced the growth of TaNx at the surface of the porous low kappa and limited infiltration of the pore network by the gas phase ALD precursors A final set of experiments involved the early stages of cobalt film formation on tantalum substrates using chemical vapor deposition with the metalorganic precursor dicobalt hexacarbonyl tert butylacetylene CCTBA Here it was found that growth proceeded in two phases The first involved the formation of an intermixed cobalt tantalum layer while the second took place after the intermixed layer was covered and was characterized by the formation of a mixed carbon cobalt film **Atomic Layer**

Deposition Applications 6 J. W. Elam, 2010-10 The continuously expanding realm of Atomic Layer Deposition ALD Applications is the focus of this reoccurring symposium ALD can enable the precise deposition of ultra thin highly conformal coatings over complex 3D topographies with controlled thickness and composition This issue of ECS Transactions contains peer reviewed papers presented at the symposium A broad spectrum of ALD applications is featured including novel nano composites and nanostructures dielectrics for state of the art transistors and capacitors optoelectronics and a variety of other emerging applications **Atomic Layer Deposition Applications 7** J. W. Elam, S. De Gendt, A. Londergan, S. F. Bent, O. van der Straten, A. Delabie, F. Roozeboom, 2011

Atomic Layer Deposition of Thin Films David Mark Fryauf, 2016 Atomic layer deposition ALD is a self limiting subset of chemical vapor deposition that has become widely popular in materials science applications such as device packaging semiconductor passivation transistor gate dielectrics optical coatings and protective barriers ALD is capable of uniformly coating high aspect ratio features such as 1 dimensional nanostructures or pinhole sized vias across a macroscopic distance which is expected to only be limited by the size of the deposition chamber This work reviews several applications of ALD used to deposit thin conformal layers of dielectric material which specifically capitalize on the precise conformal nature of the deposition process Semiconductor nanowire networks coated with aluminum oxide AlOx by plasma enhanced ALD PEALD show blue shifted photoluminescence with increasing AlOx thickness Novel memristor 0 edge0 devices fabricated with an active switching layer of titanium dioxide deposited by PEALD yield an active device cross section two orders of magnitude smaller than what is possible with conventional 2 dimensional thin film devices fabricated by similar photolithography methods Protected silver mirrors coated with AlOx deposited by PEALD have superior durability when compared to mirrors coated with an identical layer of AlOx deposited by conventional physical vapor deposition All of these applications benefit from the robust uniform coating properties of the ALD growth mechanism Additional studies of dielectric barrier overlayers deposited by ALD on silver mirrors are discussed and a figure of merit is proposed for judging overall mirror performance *Atomic Layer Deposition Applications 14* F. Roozeboom, S. De Gendt, J. W. Elam, J.

Dendooven, O. van der Straten, C. Liu, A. Illiberi, 2018-09-21 Atomic Layer Deposition Applications 13 F. Roozeboom, S. De Gendt, J. W. Elam, O. van der Straten, J. Dendooven, C. Liu, Chemistry of Atomic Layer Deposition Seán Thomas

Barry,2021-11-08 This book will help chemists and non chemists alike understand the fundamentals of surface chemistry and precursor design and how these precursors drive the processes of atomic layer deposition and how the surface precursor interaction governs atomic layer deposition processes The underlying principles in atomic layer deposition rely on the chemistry of a precursor with a surface **Atomic Layer Deposition Applications 4** Ana Londergan,2008 The continuously expanding realm of Atomic Layer Deposition ALD Applications is the symposium focus ALD can enable the precise deposition of ultra thin highly conformal coatings over complex 3D topography with controlled composition and properties This issue of the ECS Transactions contains peer reviewed papers presented at the symposium Breadths of ALD Applications are featured novel nano composites and nanostructures dielectrics for state of the art transistors and capacitors optoelectronics and a variety of other emerging applications **Atomic Layer Deposition Applications 10 F.** Roozeboom,S. De Gendt,A. Delabie,J. W. Elam,O. van der Straten,A. Londergan,2014

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