Characterization Of Bifacial Silicon Solar Cells And | 649a6430ddd4335787c2fd01024dc013

Thin Film Solar Cells

Within this work electrochemical processes for manufacturing of novel silicon solar cells are investigated. Direct plating of Ni and Al on n- and p- silicon is demonstrated by making use of solar cell characteristics. Homogenous Ni/Cu stacks are realized for bifacial and back contact solar cells, forming an excellent mechanical and electrical contact to silicon. For metallization of HIT solar cells, the plating behavior on ITO layers is studied. Additionally, plating processes on evaporated Al layers are developed and applied to back contact solar cells. By means of process optimization the plated metal...
stack on Al features sufficient adhesion and increases the lateral conductivity of the metal grid resulting in increased solar cell efficiency. An advanced metallization route for back contact solar cells which purposefully utilizes the different characteristics of the deposited metals (Al, Ni, Cu) is developed. The resulting metal stacks are characterized in detail using SEM, EDX and AES methods. Besides plating processes, local oxidizing processes for Al are established and combined with printing technologies to realize the metal contact separation for back contact solar cells.

EC Photovoltaic Solar Energy Conference

This book offers a global perspective of the current state of affairs in the field of solar power engineering. In four parts, this well-researched volume informs about: Established solar PV (photovoltaic) technologies Third-generation PV technologies based on new materials with potential for low-cost large-scale production Solar cell technology based

Solar Cells and Optics for Photovoltaic Concentration
This edited volume Solar Cells is a collection of reviewed and relevant research chapters offering a comprehensive overview of recent developments in the field of renewable energy. The book comprises single chapters authored by various researchers and is edited by a group of experts active in the physical sciences, engineering, and technology research areas. All chapters are complete in themselves but united under a common research study topic. This publication aims at providing a thorough overview of the latest research efforts by international authors on physical sciences, engineering, and technology, and opens new possible research paths for further novel developments.

Graphene for Transparent Conductors

The Handbook of Thin Film Deposition 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, new materials for memory applications and methods for thin film optical processes. In a major restructuring, this edition of the handbook lays the foundations with an up-to-date treatment of lithography, contamination and yield management, and reliability of
thin films. The established physical and chemical deposition processes and technologies are then covered, the last section of the book being devoted to more recent technological developments such as microelectromechanical systems, photovoltaic applications, digital cameras, CCD arrays, and optical thin films. A practical survey of thin film technologies aimed at engineers and managers involved in all stages of the process: design, fabrication, quality assurance and applications Covers core processes and applications in the semiconductor industry and new developments in the photovoltaic and optical thin film industries The new edition takes covers the transition taking place in the semiconductor world from Al/SiO2 to copper interconnects with low-k dielectrics Written by acknowledged industry experts from key companies in the semiconductor industry including Intel and IBM Foreword by Gordon E. Moore, co-founder of Intel and formulator of the renowned ‘Moore’s Law’ relating to the technology development cycle in the semiconductor industry

Proceedings of MELECON '85, Mediterranean Electrotechnical Conference, Madrid, Spain, October 8, 9, 10, 1985
Modelling and Optimization of Photovoltaic Cells, Modules, and Systems

Japanese Journal of Applied Physics

The first book of this four-volume edition is dedicated to one of the most promising areas of photovoltaics, which has already reached a large-scale production of the second-generation thin-film solar modules and has resulted in building the powerful solar plants in several countries around the world. Thin-film technologies using direct-gap semiconductors such as CIGS and CdTe offer the lowest manufacturing costs and are becoming more prevalent in the industry allowing to improve manufacturability of the production at significantly larger scales than for wafer or ribbon Si modules. It is only a matter of time before thin films like CIGS and CdTe will replace wafer-based silicon solar cells as the dominant photovoltaic technology. Photoelectric efficiency of thin-film solar modules is still far from the theoretical limit. The scientific and technological problems of increasing this key parameter of the solar cell are discussed in several chapters of this volume.
Green Energy

Electrical & Electronics Abstracts


Electrochemical Processes for Metallization of Novel Silicon Solar Cells.
This book presents a study to determine the current limitations in the area of Photovoltaics (PV) as a source of renewable energy and...
proposes strategies to overcome them by applying optimization approaches in three main areas, namely related to photovoltaic solar cells, modules, and systems. These include grid metallization design of Si-based solar cells and modules; cost-effectiveness analysis between Si-based monofacial and bifacial grid-connected PV systems; optimal diesel replacement strategy for the progressive introduction of PV and batteries; dispatch strategy optimization for PV hybrid systems in real time. The novelty of the work presented in this book is of high interest to the scientific community but also to the PV manufacturers, installation companies, and investors.

Photovoltaic Energy Program Contract Summary: Fiscal Year 2000

Setup of a laser facility for characterization and treatment of photovoltaic devices

To make solar energy mainstream, lower-cost and more efficient power generation is key. A lot of effort in the silicon photovoltaic industry has gone into using fewer raw materials (i.e., silicon) and
using more inexpensive processing techniques and materials to reduce cost. Utilizing thinner substrates not only reduces cost, but improves cell efficiency provided both front and back surfaces are well-passivated. In the current work, a kerf-less process is developed in which ultra-thin (~25 [μm]), flexible mono-crystalline silicon substrates can be obtained through an exfoliation technique from a thicker parent wafer. These substrates, when exfoliated, have thick metal backing which provides mechanical support to the thin silicon and enables ease of processing of the substrates for device fabrication. Optical, electrical, and reliability characterization studies for completed cells show this technology's compatibility with a heterojunction solar cell process flow. Building on the promising results achieved on exfoliated substrates, further optimization work was carried out. Namely, an improved cleaning process was developed to remove front surface contamination on textured surfaces of exfoliated, flexible mono-crystalline silicon. This process is very effective at cleaning metallic and organic residues, without introducing additional contamination or degrading the supporting back metal used for ultra-thin substrate handling. Spectroscopic studies were performed to qualitatively and quantitatively understand the efficacy of different cleaning procedures in order to develop the new cleaning process. Results of the spectroscopic studies were further supported by
comparing the electrical performance of cells fabricated with different cleans. To replace silver as contact metal with a cheaper substitute like nickel or copper, patterning and etching processes are generally used. A low-cost alternative is proposed, where a reusable shadow mask with a metal grid pattern is kept in contact with the surface of the substrate in a plasma-enhanced chemical vapor deposition chamber during silicon nitride deposition. This leaves a patterned silicon surface for selective metal growth by direct electro-deposition. The viability of this process flow is demonstrated by fabricating diffused junction n[superscript+]pp[superscript+] monofacial and bifacial cells and electrically characterizing them. Investigation of the factors limiting the efficiency of the cells was carried out by lifetime measurement experiments.

Proceedings of MELECON

The energy transition is one of the key approaches in the effort to halt climate changes, and it has become even more essential in the light of the recent COVID-19 pandemic. Fostering the energy efficiency and the energy independence of the building sector is a focal aim to move towards a decarbonized society. In this context, building physics and building energy systems are fundamental disciplines based on
applied physics applications in civil, architectural, and environmental engineering, including technical themes related to the planning of energy and the environment, diagnostic methods, and mitigating techniques. This Special Issue contains information on experimental studies in the following research topics: renewable energy sources, building energy analysis, rational use of energy, heat transmission, heating and cooling systems, thermofluid dynamics, smart energy systems, and energy service management in buildings.

Energy: a Continuing Bibliography with Indexes

Foundations for the reality of a broadly based, large scale deployment of photovoltaics in commercial applications are described. Research, development, and applications experience and efforts are presented. Special sessions on the problems relating to financing, installing, and operating photovoltaic power generating systems are given. Production problems and techniques are described.

Physics Briefs

This leading-edge volume on advances in photovoltaic technology
features diverse contributions from experts in every major geographic PV market. It examines emerging applications such as electricity grid load-balancing and demand-response, PV storage systems, photovoltaic/thermal solar collectors and carbon-offset in buildings. Engineers, researchers, developers and students alike will find new avenues for exploration and fresh insights into this continually evolving field. Highlights the most recent advances in Photovoltaics, from Next-Gen Storage Systems to Bifacial PV/T Solar Collectors; Provides expert insights on the recent evolution and near future of PV markets around the globe; Covers applications from grid-tied storage and power generation to green buildings.


**Nanostructured Solar Cells**
This book provides a systematic presentation of the principles and practices behind the synthesis and functionalization of graphene and graphene oxide (GO), as well as the fabrication techniques for transparent conductors from these materials. Transparent conductors are used in a wide variety of photoelectronic and photovoltaic devices, such as liquid crystal displays (LCDs), solar cells, optical communication devices, and solid-state lighting. Thin films made from indium tin oxide (ITO) have thus far been the dominant source of transparent conductors, and now account for 50% of indium consumption. However, the price of Indium has increased 1000% in the last 10 years. Graphene, a two-dimensional monolayer of sp2-bonded carbon atoms, has attracted significant interest because of its unique transport properties. Because of their high optical transmittance and electrical conductivity, thin film electrodes made from graphene nanosheets have been considered an ideal candidate to replace expensive ITO films. Graphene for Transparent Conductors offers a systematic presentation of the principles, theories and technical practices behind the structure–property relationship of the thin films, which are the key to the successful development of high-performance transparent conductors. At the same time, the unique perspectives provided in the applications of graphene and GO as transparent conductors will serve as a general guide to the design and fabrication of thin film
materials for specific applications.

**Crystalline Silicon Solar Cells**

**IEEE First World Conference on Photovoltaic Energy**

**Energy Research Abstracts**

Bifacial spectral response characterization of solar cells under near operating condition illumination is used in conjuncture with a novel bifacial DICE analysis to establish the collection efficiency as a function of i-layer position in p-i-n amorphous silicon solar cells. A significant portion of solar cell degradation can be explained in terms of electric field distortions which increase recombination losses. Unlike carrier lifetime reductions, the field distortions can be reduced. The numerical model is used to guide the intentional doping of the i-layer to counteract the field distortions caused by charged dangling bonds, and thus to optimize the electric field for the degraded state. Solar cells with graded low-level boron doping in
the i-layer are analysed in detail. Increasing conversion efficiency during light-soaking, and enhanced stabilized n-side performance show the viability of the electric field optimization.

**Photovoltaics for Sustainable Electricity and Buildings**

**Solar Energy Update**

This book focuses on crystalline silicon solar cell science and technology. It is written from the perspective of an experimentalist with extensive hands-on experience in modeling, fabrication, and characterization. A practical approach to solar cell fabrication is presented in terms of its three components: materials, electrical, and optical. The materials section describes wafer processing methods including saw damage removal, texturing, diffusion, and surface passivation. The electrical section focuses on formation of ohmic contacts on n and p-doped surfaces. The optical section illustrates light interaction with textured silicon surfaces in terms of geometrical, diffractive and physical optics, transmission, and surface photovoltage (SPV) spectroscopy. A final chapter analyzes
performance of solar cells, fabricated with a wide range of process parameters. A brief economic analysis on the merits of crystalline silicon-based photovoltaic technology as a cottage industry is also included. This professional reference will be an important resource for practicing engineers and technicians working with solar cell and PV manufacturing and renewable energy technologies, as well as upper-level engineering and material science students. Presents a practical approach to solar cell fabrication, and characterization; Offers modular methodology with detailed equipment and process parameters supported by experimental results; Includes processing diagrams and tables for 16% efficient solar cell fabrication.

Solar Cells

This report describes a 21-month project to demonstrate amorphous-silicon (a-Si) solar cells with high stabilized conversion efficiency. The objective was to develop a research program spanning material issues (more stable a-Si and better a-SiGe alloys) and device issues (more stable a-Si-based solar cells) with the goal of high stabilized solar cell efficiency. The Institute of Energy Conversion (IEC) produced and analyzed the stability of a-Si films and solar cells with reduced hydrogen content (2--6%). A thermodynamic model of defect
formation was developed that describes the high-temperature degraded state of a solar cell. An analysis of bifacial current voltage and quant-efficiency insults for a-SiGe p-i-n devices with transparent front and back contacts provided information about the influence of alloying and band-gap grading on hole and electron collection. IEC also studied the stability of graded and ungraded a-SiGe solar cells using bifacial devices to learn about the relative degradation of hole and electron collection, and concludes that degradation of the photoconductivity of a-SiGe materials does not agree with degradation observed in solar cells.

Cost Effective High Efficiency Solar Cells

Energy from the Desert: Practical Proposals for Very Large Scale Photovoltaic Systems

Synerjy

Nanostructured solar cells are very important in renewable energy
sector as well as in environmental aspects, because it is environment friendly. The nano-grating structures (such as triangular or conical shaped) have a gradual change in refractive index which acts as a multilayer antireflective coating that is leading to reduced light reflection losses over broadband ranges of wavelength and angle of incidence. There are different types of losses in solar cells that always reduce the conversion efficiency, but the light reflection loss is the most important factor that decreases the conversion efficiency of solar cells significantly. The antireflective coating is an optical coating which is applied to the surface of lenses or any optical devices to reduce the light reflection losses. This coating assists for the light trapping capturing capacity or improves the efficiency of optical devices, such as lenses or solar cells. Hence, the multilayer antireflective coatings can reduce the light reflection losses and increases the conversion efficiency of nanostructured solar cells.

Proceedings of the International Conference

Handbook of Thin Film Deposition
Read Online Characterization Of Bifacial Silicon Solar Cells And

Space Station Systems

Scientific and Technical Aerospace Reports

Like most industries around the world, the energy industry has also made, and continues to make, a long march toward “green” energy. The science has come a long way since the 1970s, and renewable energy and other green technologies are becoming more and more common, replacing fossil fuels. It is, however, still a struggle, both in terms of energy sources keeping up with demand, and the development of useful technologies in this area. To maintain the supply for electrical energy, researchers, engineers and other professionals in industry are continuously exploring new eco-friendly energy technologies and power electronics, such as solar, wind, tidal, wave, bioenergy, and fuel cells. These technologies have changed the concepts of thermal, hydro and nuclear energy resources by the adaption of power electronics advancement and revolutionary development in lower manufacturing cost for semiconductors with long time reliability. The latest developments in renewable resources have proved their potential to boost the
Read Online Characterization Of Bifacial Silicon Solar Cells And economy of any country. Green energy technology has not only proved the concept of clean energy but also reduces the dependencies on fossil fuel for electricity generation through smart power electronics integration. Also, endless resources have more potential to cope with the requirements of smart building and smart city concepts. A valuable reference for engineers, scientists, chemists, and students, this volume is applicable to many different fields, across many different industries, at all levels. It is a must-have for any library.

Solar Power Generation

The world's deserts are sufficiently large that, in theory, covering a fraction of their landmass with PV systems could generate many times the current primary global energy supply. In three parts, this study details the background and concept of VLS-PV, maps out a development path towards the realization of VLS-PV systems and provides firm recommendations to achieve long-term targets. This represents the first study to provide a concrete set of answers to the questions that must be addressed in order to secure and exploit the potential for VLS-PV technology and its global benefits.
Solar Cells

Building Physics and Building Energy Systems

Thin-film solar cells are either emerging or about to emerge from the research laboratory to become commercially available devices finding practical various applications. Currently no textbook outlining the basic theoretical background, methods of fabrication and applications currently exist. Thus, this book aims to present for the first time an in-depth overview of this topic covering a broad range of thin-film solar cell technologies including both organic and inorganic materials, presented in a systematic fashion, by the scientific leaders in the respective domains. It covers a broad range of related topics, from physical principles to design, fabrication, characterization, and applications of novel photovoltaic devices.

Applied Science & Technology Index
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