Introduction to Silicon-based Thin Film Solar Cells

What are the basic principles of thin-film silicon solar cells?
5.1. General principles In thin-film silicon solar cells,one so far almost exclusively uses two-terminal tandem solar cells. These devices stack two subcells,one on top of the other as indicated in Fig. 25.

How are silicon thin films deposited in solar cells?
1. Introduction Silicon thin films for solar cells are at present predominantly deposited by plasma-enhanced chemical vapor deposition(PECVD) either from silane (SiH 4) or preferably from a mixture of silane and hydrogen. They are either amorphous or microcrystalline. They contain about 5%-15% of hydrogen atoms.

What are thin film solar cells?
Thin film solar cells are favorable because of their minimum material usage and rising efficiencies. The three major thin film solar cell technologies include amorphous silicon (?-Si), copper indium gallium selenide (CIGS), and cadmium telluride (CdTe).

Who wrote the book thin-film silicon solar cells?
Proceedings of the 31st IEEE Photovoltaic Solar Energy Specialists Conference,Lake Buena Vista,Florida,2005,pp. 1593-1596. The present chapter is partly an excerpt from the book Thin-Film Silicon Solar Cells,edited by Arvind Shahand published in 2010 by the EPFL Press,Lausanne ,with contributions by Horst Schade and Friedhelm Finger.

Do thin-film silicon solar cells have a strong electric field?
For all types of p-i-n- and n-i-p-type thin-film silicon solar cells,it is of paramount importance to have a strong internal electric fieldand to avoid substantial reduction of this field by any of the effects listed earlier.

What are the disadvantages of thin-film silicon solar cells and modules?
Conclusions Thin-film silicon solar cells and modules have at present a significant disadvantage with respect to wafer-based crystalline silicon modules and even with respect to some other thin-film modules such as CIGS modules: their conversion efficiency is quite a bit lower.

Recent work reports the modeling of thin-film solar cells with an n-i-p structure based on hydrogenated amorphous silicon (a-Si:H) with subsequent manufacturing of ...

The global demand for Si-based solar cells has been rapidly increasing, requiring ever thinner Si layers to minimize material consumption. For this purpose, progress has been made toward the development of thin-film solar cells using Si materials such as microcrystalline Si (µc-Si), amorphous Si (a-Si), and their combination; 1, 2) the Si in these ...

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This is one of the main motivations for using thin-film solar cells,1 where the active layer of photovoltaic material is much thinner than with c-Si (typically in the range of nanometres up to micrometres). ... In comparison to conventional ...

The chapter introduces the basic principles of photovoltaics, and highlights the specific material and device properties that are relevant for thin-film solar cells. In general, there are two configurations possible for any thin-film solar cell. The first possibility is that light enters the device through a transparent superstrate.

The three major thin film solar cell technologies include amorphous silicon (?-Si), copper indium gallium selenide (CIGS), and cadmium telluride (CdTe). In this paper, the ...

This was recognized early on and led to an approach for improving the p/i interface regions which was based on the introduction of a wide variety of empirically derived "buffer ... Thin-film, Table 1 Best efficiencies obtained on thin-film silicon-based solar cells. Cell state (initial or stabilized) is indicated in the remark column is given

The thickness of thin-film solar cells is several nanometers to 10 u m, much smaller than the conventional first-generation crystalline silicon (cSi) solar cells [11], [40]. cSi-based thin-film solar cells are a promising option for designing efficient and low-cost PV ...

Molecular Beam Epitaxy (MBE) Silicon Based Thin Film Solar Cells 85 R molecules s8.33 1022 pAe 1 MT (1) where p is the pressure in the effusion cell, Ae is the surface area from which molecules ...

These solar cells are specifically used at places of high-performance requirements. The primary dissimilarity between thin-film and c-Si solar cells lies in the flexible pairing ...

CdTe-Based Thin Film Solar Cells: ... 1 Introduction CdTe solar cells are the most successful thin film photovoltaic technology of the last ten years. It was one of the first being brought into production together with amorphous silicon (already in ...

Thin-film cells based on silicon not only have many advantages but also have some technical problems. We believe that thin-film cells based on silicon will become an important part of the solar industry with continuous research and development in the field of science and technology. 5.5.2 Prospect and Challenges in the Future

Photovoltaic"s deal with the conversion of sunlight into electrical energy. Classic photovoltaic solar cells based on inorganic semiconductors have developed considerably [1] since the ...

The electron beam assisted chemical vapor deposition of silicon nitride anti-reflection coatings onto thin film CdS/CuInSe2 solar cells and the resultant effects on their performance are reported.

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This book gives a comprehensive introduction to the field of thin-film silicon solar cells and modules. It presents the essential theoretical and practical concepts in an easy-to-understand manner and discusses current challenges facing the ...

CdTe solar cells are the most successful thin film photovoltaic technology of the last ten years. It was one of the first being brought into production together with amorphous silicon (already in the mid-90 s Solar Cells Inc. in USA, Antec Solar and BP Solar in Europe were producing 60 × 120 cm modules), and it is now the largest in production among thin film solar ...

An alternative to c-Si solar cells is the thin-film solar cell (TFSC) formed on plastic or glass substrates [8]. For thin-film technology, there is no need for expensive and fragile crystal sawing and traction. It is mainly based on depositing very thin Si layers on low-cost substrates such as glass at temperatures far below the c-Si melting ...

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