Research on the degradation of thin film solar cells

Perovskite solar cells (PSCs), typically based on a solution-processed perovskite layer with a film thickness of a few hundred nanometers, have emerged as a leading thin-film photovoltaic technology.

Keywords: Thin-film solar cells, Design and modeling of materials and solar cell stacks, Multifunctional coatings, Semiconductors for thin-film solar cells, Transparent solar cells . Important Note: All contributions to this Research Topic must be within the scope of the section and journal to which they are submitted, as defined in ...

Perovskite solar cells are thin-film devices built with layers of materials, either printed or coated from liquid inks or vacuum-deposited. Producing uniform, high-performance perovskite material in a large-scale manufacturing environment is difficult, and there is a substantial difference in small-area cell efficiency and large-area module ...

Copper indium gallium selenide (CIGS)-based solar cells have received worldwide attention for solar power generation. CIGS solar cells based on chalcopyrite quaternary semiconductor CuIn 1-x GaxSe 2 are one of the leading thin-film photovoltaic technologies owing to highly beneficial properties of its absorber, such as tuneable direct ...

Compared to the CdS surface in conventional Sb2Se3 thin-film solar cells (FTO/CdS/Sb2Se3/Au), the surface of the CdS buffer in our solar cells was smoothed by the CeO2 layer, which induced ...

1 · Thin-film solar cells deposited on a transparent back contact bring inherent semitransparency, making them ideally suited for bifacial applications. ... Therefore, the ...

Within this study, we investigate the intrinsic photostability of thin-film solar cells, here organic photovoltaic cells. Since degradation under natural sun light ...

Thin-film solar cells are preferable for their cost-effective nature, least use of material, and an optimistic trend in the rise of efficiency. This paper presents a ...

Long-term stability is a requisite for the widespread adoption and commercialization of perovskite solar cells (PSCs). Encapsulation constitutes one of the most promising ways to extend devices for lifetime without noticeably sacrificing the high power conversion efficiencies that make this technology attractive. Among encapsulation ...

Bandgap gradient is a proven approach for improving the open-circuit voltages (VOCs) in Cu(In,Ga)Se2 and Cu(Zn,Sn)Se2 thin-film solar cells, but has not been realized in Cd(Se,Te) thin-film solar ...

From Fig. 1, we can find that light, heat, moisture and reverse bias are the main threats for solar cells to face under outdoor working conditions in addition to the mechanical stress this ...

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The potential-induced degradation (PID) mechanism in Cu(In,Ga)(Se,S)2 (CIGS) thin-film solar cells, which are alternative energy sources with a high efficiency (>23%) and upscaling possibilities ...

In this study, we investigated details in the changes of physical properties associated with the degradation and/or decomposition of perovskite films and solar ...

First results obtained for amorphous silicon (a-Si:H) based thin-film solar modules reveal that the quantitative EL analysis method is applicable to amorphous silicon technology as well.

The recent boom in the demand for photovoltaic modules has created a silicon supply shortage, providing an opportunity for thin-film photovoltaic modules to enter the market in significant quantities. Thin-films have the potential to revolutionise the present cost structure of photovoltaics by eliminating the use of the expensive silicon wafers that ...

Silicon-wafer based solar cells are still domination the market for photovoltaic energy conversion. However, most of the silicon is used only for mechanical stability, while only a small percentage of the material is needed for the light absorption. Thin film silicon technology reduces the material demand to just some hundred ...

In this research paper, a time-dependent model was created to analyse defect growth in the absorber layer of Sb 2 Se 3 thin film solar cells. The model was ...

When talking about solar technology, most people think about one type of solar panel which is crystalline silicon (c-Si) technology. While this is the most popular technology, there is another great option with a promising outlook: thin-film solar technology. Thin-film solar technology has been around for more than 4 decades and ...

Recent reviews have reported on the advancement of Sb 2 S 3-based solar cells, and in those reviews, Sb 2 S 3-based photovoltaic devices focusing on semiconductor-sensitized and planar solar cells were comprehensively discussed, and preparation methods of antimony chalcogenide-based materials were briefly outlined [4, ...

Thin film solar cells are one of the important candidates utilized to reduce the cost of photovoltaic production by minimizing the usage of active materials. However, low light absorption due to low absorption coefficient

and/or insufficient active layer thickness can limit the performance of thin film solar cells. Increasing the absorption of light that can ...

Figure 1.19 shows a 3-in. diameter thin-film QD GaAs solar cell structure that was processed into an array of individual 5 × 5 mm 2 solar cells. The structure containing 10 InAs QD layers was produced by MBE at Tampere University, ELO, and thin-film cell processing was performed by Radboud University and tf2 devices.

Researchers at the Helmholtz Center Berlin (HZB) have taken a leap forward towards a deeper understanding of an undesired effect in thin film solar cells based on amorphous silicon - one that ...

However, light induced degradation (LID) is the major problem of the amorphous silicon solar cell [1]. For this reason, hydrogenated microcrystalline silicon solar cell (µc-Si:H) have got ...

The first generation of solar cells is constructed from crystalline silicon wafers, which have a low power conversion effectiveness of 27.6% [] and a relatively high manufacturing cost.Thin-film solar cells ...

In this study, we investigated details in the changes of physical properties associated with the degradation and/or decomposition of perovskite films and solar cells using XRD, FESEM, EDX, UV-Vis ...

Degradation of MoO x Thin-Films Properties in Excessive Oxygen Environments and Its ... Leshan West Silicon Materials Photovoltaic and New Energy Industry Technology Research Institute, Leshan, 614000 China. Search for more papers by this author ... An efficiency of 20.8% was achieved for dopant-free silicon solar cells ...

Perovskite solar cells (PSCs) have already achieved efficiencies of over 25%; however, their instability and degradation in the operational environment have prevented them from becoming commercially viable. Understanding the degradation mechanism, as well as improving the fabrication technique for achieving high-quality ...

Perovskite solar cells have demonstrated the efficiencies needed for technoeconomic competitiveness. With respect to the demanding stability requirements of photovoltaics, many techniques have ...

To track the latest progress in this research field, this Collection aims to publish the latest experimental and theoretical investigations on thin-film solar cells, with special attention to ...

In recent years, perovskite solar cells (PSCs) have been the focus of research in the field of photovoltaic devices due to their simple fabrication process, high efficiency, and environmental protection of materials [[1], [2], [3], [4]].As shown in Fig. 1, the perovskite material has an ABX 3 crystal structure [5], where A site is monovalent cation ...

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

Antimony selenide (Sb2Se3) is a promising photovoltaic thin-film absorber material that has been widely studied in recent years. In Sb2Se3 thin-film solar cells, cadmium sulfide (CdS) is generally used for the fabrication of electron collection layers because of its high electron affinity, electronic mobility, and environmental stability. This ...

CIGS thin-film solar technology: Understanding the basics A brief history... CIGS solar panel technology can trace its origin back to 1953 when Hahn made the first CuInSe 2 (CIS) thin-film solar cell, which was nominated as a PV material in 1974 by Bell Laboratories. In that year, researchers began to test it, and by 1976 University ...

Perovskite solar cell (PSC) is an emerging photovoltaic technology with a striking 25.5% laboratory scale power conversion efficiency (PCE) (NREL, 2020), that has been achieved in less than ten years of research (Jeon et al., 2015, Lee et al., 2012, NREL, 2020).The "perovskite" refers to the hybrid organic-inorganic perovskite absorbers with ...

Plasmonic structures are desirable methods of improving localized light absorption and improving the performance of thin solar cells. The metal nanostructures control light concentration and trap at a submicrometric scale. This paper presents a metal-insulator-metal waveguide for improving solar cell absorption and efficiency. ...

A damage-induced conversion efficiency degradation (DCED) model is developed and validated by experiments, providing an ...