Mechanical stress efect on organic photovoltaics

Developing intrinsically stretchable organic photovoltaics (IS-OPVs) is crucial for serving as power sources in future portable and wearable electronics. PEDOT:PSS is most commonly used to prepare highly conductive, transparent electrodes with high stretchability.

This paper describes the effects of tensile strains up to 20% on the photovoltaic properties of solar cells based on two types of conjugated polymers, and their blends with a ...

Over the past 20 years, significant progress has been made in organic photovoltaics (OPVs) due to its advantages of being cost-effective, being lightweight, and having flexible manufacturability.

The effect of FCBSs length on solubility of the acceptor polymers, and their photovoltaic and mechanical properties in all-polymer solar cells were explored. This work provides useful guidelines for the design of semiconducting polymers by introducing FCBS with proper length, which can giantly improved properties that are not possible to be ...

Mechanical residual stresses within multilayer thin-film device stacks become problematic during thermal changes because of differing thermal expansion and contraction of the various layers. Thin-film photovoltaic (PV) devices are a prime example where this is a concern during temperature fluctuations that occur over long deployment lifetimes. Here, we show ...

Article In situ formation of thermoset matrices for improved stability in organic photovoltaics Jianhua Han,1,2 Han Xu,1 Anirudh Sharma,1 Maxime Babics,1 Jules Bertrandie,1 Xunchang Wang,3 Luis Huerta Hernandez,1 Yongcao Zhang,1 Yuanfan Wen,1 Diego Rosas Villalva,1 Nicolas Ramos,4 SriHarishK.Paleti,1,5 JaimeMartin,4 FuzongXu,1 JoelTroughton,1 ...

This review paper provides an in-depth analysis of the latest developments in silicon-based, organic, and perovskite solar cells, which are at the forefront of photovoltaic research.

DOI: 10.1016/J.SOLENER.2014.04.012 Corpus ID: 122016755; Residual stress and mechanical property measurements in amorphous Si photovoltaic thin films @article{Antartis2014ResidualSA, title={Residual stress and mechanical property measurements in amorphous Si photovoltaic thin films}, author={Dimitrios A. Antartis and Ioannis D. Chasiotis}, journal={Solar Energy}, ...

In this study, we demonstrate the in-situ-forming cross-linked thermoset (CLT) matrices in organic semiconductor blends as an efficient and universal strategy for developing resilient organic photovoltaics (OPVs). The synergistic effect of high modulus, high glass transition temperature, and H-bonding interactions

endows CLT-based OPV devices with simultaneously ...

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Encouragingly, the results indicated that the nanoscale morphology and charge extraction capabilities of the devices were maintained under severe mechanical stress. Finally, we evaluated the mechanical stability of the ultra-flexible semi-transparent organic photovoltaic (ST-OPV) under 1,000 cycles of 200% compressive strain and release.

Clearly, our experimental studies show that mechanical bending can largely increase the photovoltaic actions, leading to mechanically tunable photovoltaic effects in organic-inorganic hybrid perovskites. We note that our mechanical bending occurs within elastic deformation zone in the polycrystalline perovskite films.

Organic-inorganic hybrid perovskites simultaneously possess strong spin-orbit coupling (SOC) and structure inversion asymmetry, establishing a Rashba effect to influence light emission and photovoltaics. Here, we use mechanical bending as a convenient approach to investigate the Rashba effect throug ...

A review of photovoltaic performance of organic/inorganic solar cells for future renewable and sustainable energy technologies. ... Fossil fuels also affect the air quality and public health by emitting green house gases like CO 2 and other air pollutants. Based on the current economic growth figures, the world needs energy of 28 TW in 2050 and ...

To protect brittle layers in organic photovoltaic devices, the mechanical neutral plane strategy can be adopted through placing the brittle functional materials close to the neutral plane where stress and strain are zero during bending. ... In order to demonstrate the effect of the multiple neutral planes, direct comparison between single and ...

Organic photovoltaics (OPVs) are an emerging solar cell technology that is cost-effective 1,2,3, lightweight 4,5 and flexible 4,6,7,8.Moreover, owing to their energy-efficient production and non ...

Here, we investigated the electronic band structure and carrier transport mechanism of Cu 2 ZnSn(S,Se) 4 (CZTSSe) photovoltaic devices under mechanical stress. Highly efficient flexible CZTSSe ...

Herein, we demonstrate high-performance intrinsically stretchable organic photovoltaics with an initial power conversion efficiency of 14.2%, exceptional stretchability ...

Recent advancements in the development of organic electronics have led to the investigation of natural, biodegradable materials to achieve greener alternatives to current electronics. Shellac, a natural resin material, has recently shown great potential as a dielectric and substrate in greener organic electronics. With this

material, the evaluation of other properties, ...

Strain (e) is defined as a structural deformation of a material in response to applied stress (s) 9.This stress can be from external forces on the material, or internal structural defects such ...

Organic-inorganic hybrid perovskites simultaneously possess strong spin-orbit coupling (SOC) and structure inversion asymmetry, establishing a Rashba effect to influence light emission and photovoltaics. Here, we use mechanical bending as a convenient approach to investigate the Rashba effect through SOC in perovskite (MAPbI3-xClx) films by elastically deforming grains. ...

The benefits of enabling mechanical flexibility in next-generation photovoltaics are primarily twofold: besides enriching the solar cell/module functionality (e.g., for applications in wearable electronics and building integration), it can further facilitate large-scale installation using high-throughput techniques such as roll-to-roll fabrication.

The key to improving the mechanical stability of OPVs lies in realizing mechanically robust active layers. This perspective first analyzes working scenarios of flexible OPVs (static and dynamic conditions) and ...