2014 Proceedings
The Polymer Society of Korea

Annual Fall Meeting

한국고분자학회
The Polymer Society of Korea

Jeju CVB
Jeju Convention & Visitors Bureau
processible inorganic semiconductors such as high processing temperature and weak chemical resistance in precursor solution. In this study, we designed and synthesized high thermal and chemical resistant pyridine containing polymers as organic gate dielectric for solution processible inorganic semiconductor TFTs.

3PS-284 홍수나 Synthesis and Characterization of Thiendiol-ended (TH)-based Conjugated Polymers

3PS-285 최인수 Tuning the Graphene Oxide Properties of Organic Solar Cells via Metal Chloride Dopant

3PS-286-288 바웅, 희슬, 조재현, 최인수, 그리고

3PS-287 바웅, 희슬, 조재현, 그리고

3PS-288 최인수 Solvent evaporation–assisted crystal growth of perovskite to achieve high performance inorganic–organic hybrid solar cells

3PS-289 구석현 Solution–processed CIGS thin films and their application in solar cells


Solvent evaporation-assisted crystal growth of perovskite to achieve high performance organic-inorganic hybrid solar cells

배승현, 한승진, 조원호*
서울대학교 재료공학부

Perovskite-based organic-inorganic hybrid solar cells have recently received great attention from both academia and industry. Methylammonium lead iodide (MAPbI$_3$) for perovskite solar cells is one of the most-commonly used compounds as a photon absorber. In this study, we have demonstrated a novel method for formation of perovskite film on the PEDOT:PSS coated substrate using DMSO as a processing solvent, where the film is formed via the solvent evaporation-assisted crystal growth. When the MAPbI$_3$ film is fabricated by the method using DMSO as a solvent, the film exhibits a flower-like morphology with good coverage and the crystals in the film are highly oriented along the (112) direction. As a result, the pervoskite solar cell fabricated from DMSO solution exhibits a PCE of 9.29% with a $J_{SC}$ of 16.13 mA/cm$^2$ while the cell fabricated from the conventional DMF solution shows a PCE of 4.52% with a $J_{SC}$ of 9.51 mA/cm$^2$. 
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Introduction

Advantages of perovskite solar cells

- Easy and low-cost process
- Extremely long exciton diffusion length
- High open-circuit voltage ($V_{OC}$) with wide optical band gap ($E_g$)
- Good absorption coefficients

Solvent engineering

- Methacrylonitrile lead triiodide (CH$_3$N$_2$PbI$_3$) is the most popular material

Results

Schematic plot

- Growth of MAPbI$_3$
- DMF solution: crystallization during the spin-coating process
- DMSO solution: crystallization during the thermal treatment

Film morphology

- AFM images
  - DMF: poor film coverage
  - DMSO solution: good film coverage

Crystallinity

- XRD
- DMSO: highly oriented perovskite film, higher crystallinity than films from DMF

Photovoltaic properties

- J–V curves
- EQE spectra
- Open-circuit voltage ($V_{OC}$) versus optical band gap ($E_g$) for the best-in-class solar cells

Objectives

- To fabricate perovskite film for the enhancement of power conversion efficiency in MAPbI$_3$ perovskite photovoltaic cells
- To investigate the photovoltaic properties and crystallinity of perovskite relying on a solvent used for active layer (DMF, DMSO)

Conclusions

- The usage of DMSO as a solvent for a perovskite film contributes to the good coverage and the crystallinity of perovskite.
- The perovskite film fabricated by DMSO solvent provides the enhancement of $J_{SC}$ (17.80 mA cm$^{-2}$) with PCE (12.08%) in a perovskite photovoltaic cell compared to a cell with DMF ($J_{SC}$: 5.68 mA cm$^{-2}$, PCE: 0.53%).