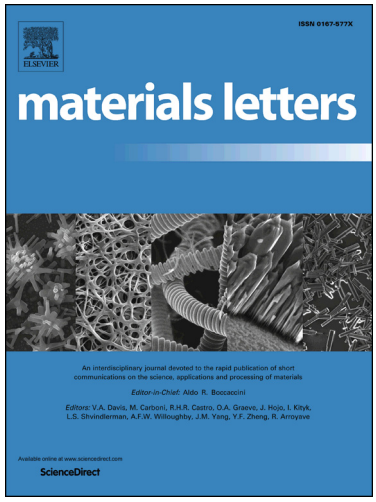

Solvothermal synthesis of highly crystalline SnO_2 nanoparticles for flexible perovskite solar cells application

Haixia Xie, Xingtian Yin, Peng Chen, Jie Liu, Chenhui Yang, Wenxiu Que, Gangfeng Wang

PII: S0167-577X(18)31509-X
DOI: https://doi.org/10.1016/j.matlet.2018.09.117
Reference: MLBLUE 24985

To appear in: *Materials Letters*

Received Date: 16 July 2018
Revised Date: 12 September 2018
Accepted Date: 21 September 2018

Please cite this article as: H. Xie, X. Yin, P. Chen, J. Liu, C. Yang, W. Que, G. Wang, Solvothermal synthesis of highly crystalline SnO_2 nanoparticles for flexible perovskite solar cells application, *Materials Letters* (2018), doi: https://doi.org/10.1016/j.matlet.2018.09.117

Solvothermal synthesis of highly crystalline SnO_2 nanoparticles for flexible perovskite solar cells application

Haixia Xie[a], Xingtian Yin[a], Peng Chen[a], Jie Liu[a], Chenhui Yang[a], Wenxiu Que[a]*, Gangfeng Wang[b]*

[a]*Electronic Materials Research Laboratory, Key Laboratory of the Ministry of Education, International Center for Dielectric Research, Shaanxi Engineering Research Center of Advanced Energy Materials and Devices, School of Electronic & Information Engineering, Xi'an Jiaotong University, Xi'an 710049, Shaanxi, People's Republic of China.*

[b]*State Key Laboratory for Strength and Vibration of Mechanical Structures, Department of Engineering Mechanics, School of Aerospace Engineering, Xi'an Jiaotong University, Xi'an 710049, Shaanxi, People's Republic of China.*

*Corresponding author: wxque@mail.xjtu.edu.cn; wanggf@mail.xjtu.edu.cn.

Abstract

Flexible perovskite solar cells are arising researchers' attentions due to their promising potential applications. In this letter, homogeneous and highly crystalline SnO_2 nanoparticles are successfully synthesized by a solvothermal method, which are then employed to deposit high quality electron transport layers by spin coating and baking at a temperature as low as 150 °C. The prepared SnO_2 layer has a homogenous and flat surface without any pinholes. The resulting flexible perovskite solar cell shows a high power conversion efficiency of 13.90%, which is mainly attributed to the good transmittance, efficient electron extraction and hole blocking ability of the SnO_2 electron transport layer.

Keywords: Nanoparticles; Solvothermal; Solar energy materials.

1. Introduction

Organic-inorganic hybrid perovskite solar cells (PSCs) have made great progress in recent years partially due to the extraordinary properties of perovskite absorbers such as high charge carrier mobility, long carrier lifetime, excellent light harvesting and so on[1]. High quality perovskite absorbers can be deposited at a relative low temperature, making them very suitable for industry-scalable role-to-role flexible devices technology. However, most high efficiency PSCs contain a high temperature derived inorganic semiconductor carrier transport layer, which make them uncompetitive with the polymer substrates and hinder their applications in flexible devices. Therefore, many researchers have been focusing their attentions on low temperature derived electron transport layers (ETLs) and hole transport layers (HTLs) for flexible PSCs, such as TiO_2, Zn_2SnO_4 and NiO_x[2-4].