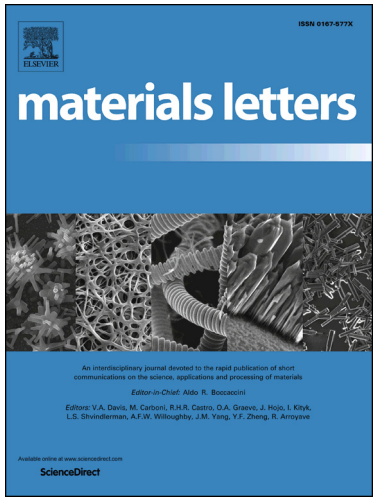

Preparation of $CH_3NH_3PbCl_3$ film with a large grain size using PbI_2 as Pb source and its application in photodetector

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PII: S0167-577X(18)30358-6
DOI: https://doi.org/10.1016/j.matlet.2018.03.002
Reference: MLBLUE 23963

To appear in: *Materials Letters*

Received Date: 10 January 2018
Revised Date: 27 February 2018
Accepted Date: 1 March 2018

Please cite this article as: L. Xiao, J. Xu, J. Luan, X. Yu, B. Zhang, S. Dai, J. Yao, Preparation of $CH_3NH_3PbCl_3$ film with a large grain size using PbI_2 as Pb source and its application in photodetector, *Materials Letters* (2018), doi: https://doi.org/10.1016/j.matlet.2018.03.002

Preparation of $CH_3NH_3PbCl_3$ film with a large grain size using PbI_2 as Pb source and its application in photodetector

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Abstract:

Uniform and pinhole-free $CH_3NH_3PbCl_3$ perovskite film was achieved via the facile low-vapor assisted solution process using PbI_2 as Pb source for the first time. This method makes possible for the mass production of well-crystalized $CH_3NH_3PbCl_3$ thin films with average grain size of 1.5 μm, which is among the largest of reported. The photodetector based on the as-prepared $CH_3NH_3PbCl_3$ film was of good photocurrent repeatability and quick response with highest photoresponse of 297 μA/W.

Keywords: perovskite; vapor-assisted solution process; $CH_3NH_3PbCl_3$; photodetector

1. Introduction

The original $CH_3NH_3PbCl_3$ based photodetector was designed by depositing metal electrode onto both side of the polished $CH_3NH_3PbCl_3$ single crystal film [1]. However, unavoidable disadvantages for the application of the bulk materials in thin film devices is to be concerned, such as longer grow time for material, bad contact with the substrates and film thickness limited by the polishing technology [1, 2]. To advance the applicability of $CH_3NH_3PbCl_3$ film optoelectronic devices, researchers were devoted to explore simple solution process to achieve high quality $CH_3NH_3PbCl_3$ film on substrates in situ [3-5]. However, the usually adopted Pb source of $PbCl_2$ has very low solubility in common solvent and the thermal evaporating process of $PbCl_2$ is thought to be not environmental friendly [3, 6-8]. Therefore, developing facile method and new Pb source to prepare $CH_3NH_3PbCl_3$ film is highly demanded.