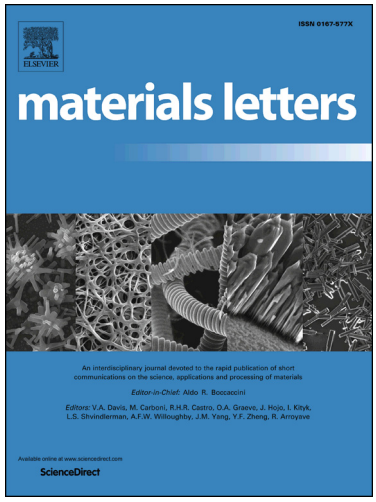

Fabrication of Symmetric supercapacitor using cesium lead iodide ($CsPbI_3$) microwire

Prasenjit Maji, Apurba Ray, Priyabrata Sadhukhan, Atanu Roy, Sachindranath Das

PII: S0167-577X(18)30855-3
DOI: https://doi.org/10.1016/j.matlet.2018.05.101
Reference: MLBLUE 24401

To appear in: *Materials Letters*

Received Date: 26 April 2018
Revised Date: 16 May 2018
Accepted Date: 22 May 2018

Please cite this article as: P. Maji, A. Ray, P. Sadhukhan, A. Roy, S. Das, Fabrication of Symmetric supercapacitor using cesium lead iodide ($CsPbI_3$) microwire, *Materials Letters* (2018), doi: https://doi.org/10.1016/j.matlet.2018.05.101

Fabrication of Symmetric supercapacitor using cesium lead iodide ($CsPbI_3$) microwire

Prasenjit Maji, Apurba Ray, Priyabrata Sadhukhan, Atanu Roy, Sachindranath Das*

Department of Instrumentation Science, Jadavpur University, Jadavpur, Kolkata-700032, India

E-mail: sachindran.das@jadavpuruniversity.in;sachindas15@gmail.com

ABSTRACT

$CsPbI_3$ has been synthesized by chemical route in ambient environment. Orthorhombic phase of $CsPbI_3$ has been confirmed by x-ray diffraction spectra followed by Rietveld refinement. We have fabricated a symmetric supercapacitor (SSC) with $CsPbI_3$ as electrode material to demonstrate the charge storing capability. The device shows good electrochemical properties with specific capacitance 7.23 mF cm^{-2} at a scan rate 2mV S^{-1} and 65.5 % cyclic stability after 1000 cycles. So, this $CsPbI_3$ can be used as a promising energy storage electrode material in future.

Keywords: $CsPbI_3$ Microwire, Rietveld, Energy storage, SSC

1. Introduction

In last few years, organo-metallic/inorganic halide perovskite have drawn a considerable attention in different optoelectronics applications like solar cell, LED and photodetector[1]. But degradable nature of hybrid organic-inorganic perovskite in presence of UV and humidity is a fateful threat for further improvement. In that scenario, David Cahen et. al. demonstrated that cesium can enhance the material stability as light harvester with good device efficiency compared to methyle ammonium(MA)[2].$CsPbX_3$ (X-Cl, Br, I) nanocrystals have already shown excellent photo-physical property including high photo luminescence quantum yield (up to 90%), moderate recombination length and narrow emission line width[3]. Other potential applications can also be found in light emitting diode, quantum LASER and photodetector which clinch the worth of inorganic perovskite nanostructure. Nowadays, the design and fabrication of highly efficient portable energy storage device has drawn a major concern to overcome growing energy demand[4].Supercapacitor became one of the most promising candidate as next generation energy storage device due to fast charging/discharging, long cycle stability, superior reversibility and outstanding power performance[5,6]. In electrochemical double layer capacitors (EDLCs), electrostatic charges are being stored at the surface of the electrode material by electrostatic non-Faradic process. Whereas the pseudocapacitor can store charges via fast and reversible redox reactions within electrode material[7]. Besides many advantages, supercapacitor possesses one major drawback of having low energy density compared to conventional batteries.