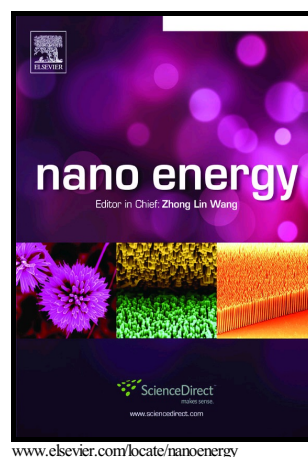


Author's Accepted Manuscript

Modulations of various alkali metal cations on organometal halide perovskites and their influence on photovoltaic performance

Zeguo Tang, Satoshi Uchida, Takeru Bessho, Takumi Kinoshita, Haibin Wang, Fumiyasu Awai, Ryota Jono, Masato M. Maitani, Jotaro Nakazaki, Takaya Kubo, Hiroshi Segawa



PII: S2211-2855(17)30823-6
DOI: <https://doi.org/10.1016/j.nanoen.2017.12.047>
Reference: NANOEN2428

To appear in: *Nano Energy*

Received date: 1 November 2017
Revised date: 28 December 2017
Accepted date: 29 December 2017

Cite this article as: Zeguo Tang, Satoshi Uchida, Takeru Bessho, Takumi Kinoshita, Haibin Wang, Fumiyasu Awai, Ryota Jono, Masato M. Maitani, Jotaro Nakazaki, Takaya Kubo and Hiroshi Segawa, Modulations of various alkali metal cations on organometal halide perovskites and their influence on photovoltaic performance, *Nano Energy*, <https://doi.org/10.1016/j.nanoen.2017.12.047>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting galley proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Modulations of various alkali metal cations on organometal halide perovskites and their influence on photovoltaic performance

Zeguo Tang^{a,*}, Satoshi Uchida^{a,*}, Takeru Bessho^a, Takumi Kinoshita^a, Haibin Wang^a, Fumiyasu Awai^b, Ryota Jono^a, Masato M. Maitani^a, Jotaro Nakazaki^b, Takaya Kubo^a, and Hiroshi Segawa^{a,b,*}

^a *Research Center for Advanced Science and Technology (RCAST), The University of Tokyo, 4-6-1, Komaba, Meguro-Ku, Tokyo 153-8904, Japan.*

^b *Graduate School of Arts and Sciences, The University of Tokyo, 3-8-1, Komaba, Meguro-Ku, Tokyo 153-8902, Japan.*

*E-mail: tangzg@dsc.rcast.u-tokyo.ac.jp (Z. Tang);
uchida@rcast.u-tokyo.ac.jp (S. Uchida);
csegawa@mail.ecc.u-tokyo.ac.jp (H. Segawa).*

Keywords: Alkali metal cations, perovskite solar cells, defect, hysteresis, high efficiency

Abstract: The crystal structure and properties of organometal halide perovskites incorporating various alkali metal cations were systematically investigated. The X-ray diffraction results suggested that the lattice constant of the perovskites incorporating Li⁺, Na⁺ or K⁺ is larger than that of the perovskite without incorporation, while the incorporation of Rb⁺ or Cs⁺ did not change the lattice constant. The incorporation of Li⁺, Na⁺ or K⁺ resulted in a red shift in absorption edge, whereas the incorporation of Rb⁺ or Cs⁺ caused a blue shift. The identical trend was also found in the photoluminescence spectra, indicating the modification of the band gap by the alkali cations. The valence band maximum and conduction band minimum of the perovskites containing Li⁺, Na⁺ or K⁺ were upshifted, while those were downshifted in the Cs⁺ case. The assessments of the carrier lifetime and the defect revealed that the K⁺ containing perovskite had the least defect, followed by the perovskites containing Rb⁺, Cs⁺ and Na⁺. In addition to the barrier at the perovskite/TiO₂ interface, the defects in perovskites played a crucial role in hysteresis in the current versus voltage curves. Consequently, the efficiency of more than 20% with negligible hysteresis was achieved in K⁺ containing perovskite solar cells.

Download English Version:

<https://daneshyari.com/en/article/7952868>

Download Persian Version:

<https://daneshyari.com/article/7952868>

[Daneshyari.com](https://daneshyari.com)