Accepted Manuscript

Lead-free perovskite based bismuth for solar cells absorbers

Ismail Benabdallah, Mourad Boujnah, Abdallah El Kenz, Abdelilah Benyoussef, Mohamed Abatal, Ali Bassam

PII: S0925-8388(18)33590-4

DOI: 10.1016/j.jallcom.2018.09.332

Reference: JALCOM 47751

To appear in: *Journal of Alloys and Compounds*

Received Date: 6 July 2018

Accepted Date: 25 September 2018

Please cite this article as: I. Benabdallah, M. Boujnah, A. El Kenz, A. Benyoussef, M. Abatal, A. Bassam, Lead-free perovskite based bismuth for solar cells absorbers, *Journal of Alloys and Compounds* (2018), doi: https://doi.org/10.1016/j.jallcom.2018.09.332.

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 proof before it is published in its final 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.

ACCEPTED MANUSCRIPT

Lead-Free Perovskite based bismuth for solar cells absorbers

Ismail Benabdallah[1], Mourad Boujnah[1,*], Abdallah El Kenz[1], Abdelilah- Benyoussef[1,2], Mohamed Abatal[3], Ali Bassam[4]

[1] *Laboratory of Condensed Matter and Interdisciplinary Sciences (LaMCScI), Faculty of Sciences, University Mohammed V-, Rabat, Morocco*

[2] *Hassan II Academy of Science and Technology, Rabat, Morocco*

[3] *Faculty of Engineering, Autonomous University of Carmen, 24180, del Carmen, Campeche, Mexico*

[4] *Faculty of Engineering, Autonomous University of Yucatán, Av. Industrias no Contaminantes, Mérida, Yucatán, Mexico*

* Corresponding authors: boujnah.mourad@gmail.com

Abstract:

Structural, electronic and optical absorption spectrum properties of lead free organometal halide perovskite $CH_3NH_3BiX_3$ ($X = I_2Te$, I_2S, I_2Se) as a new absorber for solar cells are studied in comparison to the well-known methylammonium lead iodide perovskite ($CH_3NH_3PbI_3$) by using first principle calculations. $CH_3NH_3PbI_3$ is known to be one of the major breakthrough in absorbing layers for solar cell material researches. These properties allowed this material to break records in the photoelectric conversion reaching 22% in Power Conversion Efficiency (PCE) in a short period of time, but this material have some drawbacks, putting obstacles for its commercialization. First one is the instability and the second one is the toxicity of lead. It was the reason why, the choice of Bi was the most appropriate to use in $CH_3NH_3BiI_2Te$, $CH_3NH_3BiI_2S$ and $CH_3NH_3BiI_2Se$ as it is a non-toxic element and also for the fact that it does not induce a big difference in the electronic structure, being close to lead in the periodic table. Furthermore, for its high optical absorption in the visible obtained on $CH_3NH_3BiI_2Te$, $CH_3NH_3BiI_2S$ and $CH_3NH_3BiI_2Se$ compounds. These advantages may suggest that halide perovskite $CH_3NH_3BiX_3$ ($X = I_2Te$, I_2S, I_2Se) based bismuth could be a promising alternative to $CH_3NH_3PbI_3$. These results may provide a basis for future applications in photovoltaic domain.

Keywords: Lead free perovskite, absorber materials, solar cells, first principle calculations.

Download English Version:

https://daneshyari.com/en/article/11020042

Download Persian Version:

https://daneshyari.com/article/11020042

Daneshyari.com