

Fabrication and characterization of organolead halide perovskite based solar cells

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Introduction

The demand for new materials, to improve the power conversion efficiency and to reduce the cost of photovoltaic cells, has triggered our interest to study the Organolead Halide Perovskite based solar cells.

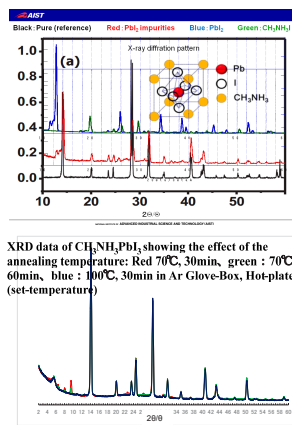
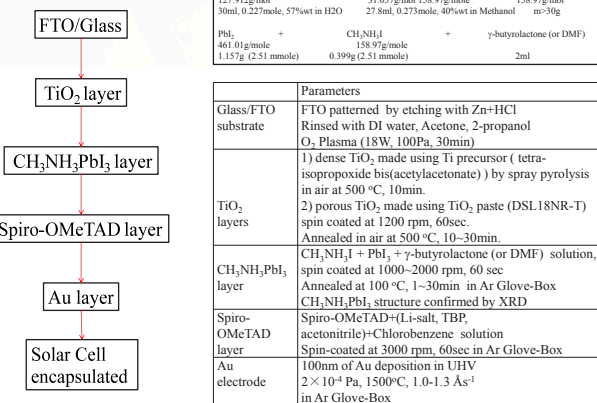
- 1) Relatively high power conversion efficiency (PCE)
PCE exceeding 16% was demonstrated, and PCE higher than 20% is expected
Tunable direct band gap semiconductor (1.3~1.5eV)
Open circuit voltage (Voc~1V)
High electron and hole mobility are already demonstrated
- 2) Relatively low-cost materials and processing technologies
low-cost and available materials (their toxicity might be an issue)
low-cost and low-temperature processing technologies such as printing are possible

Experimental

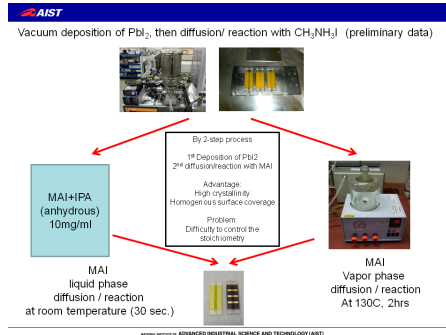
- The purpose of this study is to identify some of the issues that are facing Organolead Halide Perovskite based solar cells and to explore new solutions.
- We have synthesized the Organolead Halide Perovskite and fabricated solar cells according to previous works (1). Materials are characterized by x-ray diffraction techniques and solar cells are characterized by recording I-V and EQE spectra.

Synthesis of CH₃NH₃PbI₃ Organolead Halide Perovskite

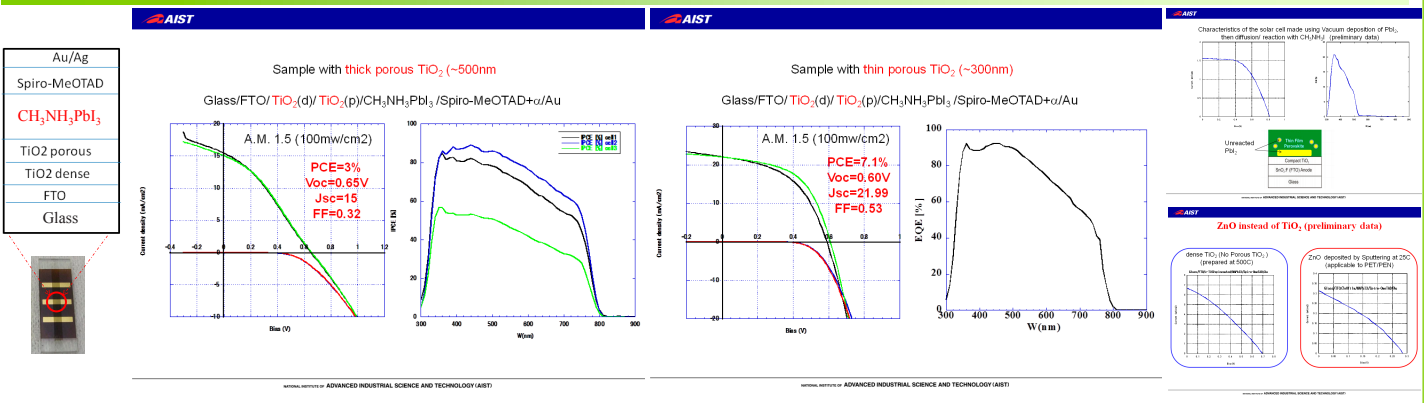
Flow chart and parameters



Exploring different approach to make films



Fabrication and Characterization of the solar cells



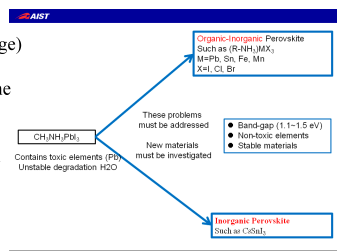
Conclusions / perspectives

We have been able to reproduce the reported results, yet we have not reach PCE ~16%
Optimizations are in progress
(thickness, concentration, uniformity, coverage)

We have observed that the purification of the materials and solvents is essential.

Encapsulation of the device is also crucial to especially prevent adsorption of water

We are exploring different materials and different device structure



References / Acknowledgements

- (1) "Efficient Hybrid Solar Cells Based on Meso-Superstructured Organometal Halide Perovskites", M. Lee, J. Teuscher, T. Miyasaka, T. N. Murakami, H. Snaith, Science, Vol 338, pp 643 (2 Nov. 2012)

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