



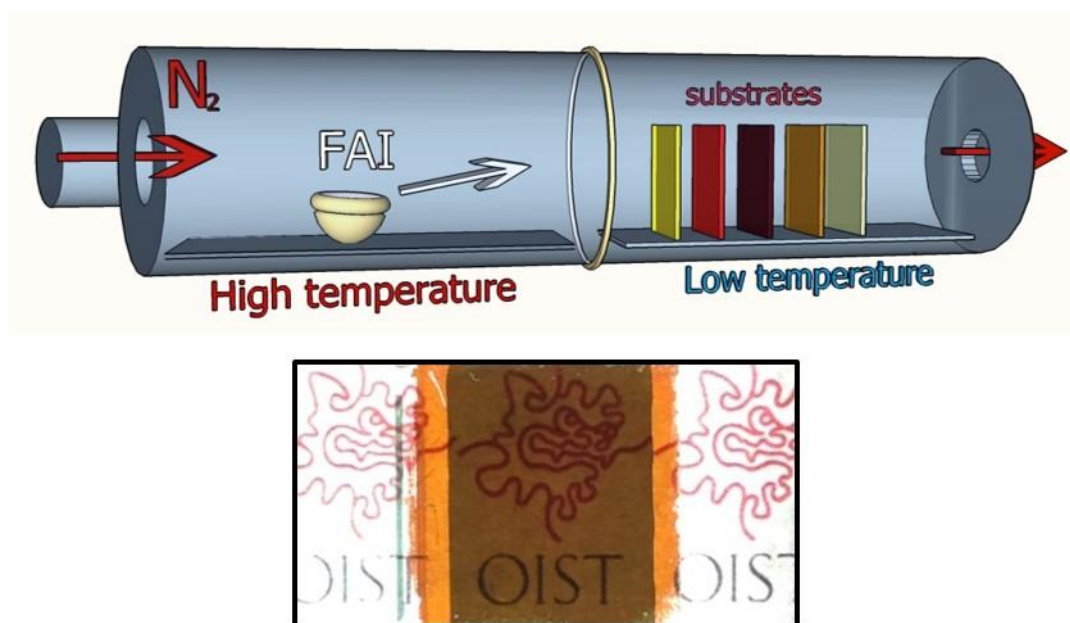
## Perovskite Solar Cells by Chemical Vapor Deposition

Energy Materials and Surface Sciences Unit (EMSS), Okinawa Institute of Science and Technology Graduate University (OIST)<sup>1</sup>, Matthew R. Leyden<sup>1</sup>, Yabing Qi<sup>1,\*</sup>  
 yabing.qi@oist.jp\*

Perovskite solar cells have attracted world-wide attention because of their high efficiencies and compatibility with low-cost fabrication methods. We have developed the Hybrid Chemical Vapor Deposition (H-CVD), which is an inexpensive way to batch-process solar cells with good uniformity and facilitates low-cost production.<sup>1,2</sup> Solar cell fabrication has been demonstrated using H-CVD with MAI and FAI, with respective maximum efficiencies of 15.6% and 14.2%.

<sup>1</sup> Matthew R. Leyden, Michael V. Lee, Sonia R. Raga, Yabing Qi\*, “Large formamidinium lead trihalide perovskite solar cells using chemical vapor deposition with high reproducibility and tunable chlorine concentrations”, *J. Mater. Chem. A* **3**, 16097 (2015)

<sup>2</sup> Matthew R. Leyden, Luis K. Ono, Sonia R. Raga, Yuichi Kato, Shenghao Wang, Yabing Qi\*, “High Performance Perovskite Solar Cells by Hybrid Chemical Vapor Deposition”, *J. Mater. Chem. A* **2**, 18742 (2014)



**Figure** Schematic of perovskite growth and photo of device. Top: Schematic of a chemical vapor deposition system for the growth of perovskite on substrates pre-deposited with  $\text{PbCl}_2$ . Bottom: Photograph of a  $1 \text{ cm}^2$  completed cell with a thin semi-transparent gold top contact.