Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Light-modulated scanning tunneling microscopy studied on photoinduced carrier generations at PbI_2/perovskite interface of perovskite solar cells YA-PING CHIU, National Taiwan University, Taiwan, MIN-CHUAN SHIH, Department of Physics, National Sun Yat-sen University, Taiwan , SHAO-SIAN LI, Department of Materials Science and Engineering, National Taiwan University, Taiwan, CHENG-HUA HSIEH, Department of Physics, National Sun Yat-sen University, Taiwan, YING-CHIAO WANG, Department of Materials Science and Engineering, National Taiwan University, Taiwan, HUNG-DUEN YANG, Department of Physics, National Sun Yat-sen University, Taiwan , CHIA-SENG CHANG, Institute of Physics, Academia Sinica, Taiwan, CHUN-WEI CHEN, Department of Materials Science and Engineering, National Taiwan University, Taiwan — Perovskite solar devices based on $CH_3NH_3PbX_3$ (X = Cl, Br, I) have recently shown tremendous efficiency enhancements up to 20% in photovoltaic applications. The presence of PbI2 in perovskite films has been found to affect the charge carrier transport behaviors and device performance of perovskite solar cells. In this work, we employed the unique ability of light-modulated scanning tunneling microscopy (LM-STM) technique to dircetly reveal the correlation of the nanoscaled compositional distributions and photo-induced interfacial electronic structures at the PbI2/perovskite interface of perovskite grains under light illumination. The result reveals the important role of the optimum PbI_2 passivation layers (a thickness less than 20 nm) on the charge separation and recombination at perovskite crystal grains. The unique LM-STM technique demonstartes great potential for application in the future exploring photovoltaic systems.

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Date submitted: 11 Nov 2016 Electronic form version 1.4