Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

ZnO nanostructures as electron extraction layers for hybrid perovskite thin films[1] KATERINA NIKOLAIDOU, SOM SARANG, VINCENT TUNG, JENNIFER LU, SAYANTANI GHOSH, Univ of California - Merced — Optimum interaction between light harvesting media and electron transport layers is critical for the efficient operation of photovoltaic devices. In this work, ZnO layers of different morphologies are implemented as electron extraction and transport layers for hybrid perovskite $CH_3NH_3PbI_3$ thin films. These include nanowires, nanoparticles, and single crystalline film. Charge transfer at the ZnO/perovskite interface is investigated and compared through ultra-fast characterization techniques, including temperature and power dependent spectroscopy, and time-resolved photoluminescence. The nanowires cause an enhancement in perovskite emission, which may be attributed to increased scattering and grain boundary formation. However, the ZnO layers with decreasing surface roughness exhibit better electron extraction, as inferred from photoluminescence quenching, reduction in the number of bound excitons, and reduced exciton lifetime in $CH_3NH_3PbI_3$ samples. This systematic study is expected to provide an understanding of the fundamental processes occurring at the ZnO-$CH_3NH_3PbI_3$ interface and ultimately, provide guidelines for the ideal configuration of ZnO-based hybrid Perovskite devices.

[1]This research was supported by National Aeronautics and Space administration (NASA) grant no: NNX15AQ01A

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Date submitted: 08 Nov 2016 Electronic form version 1.4