Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Reliable thermal processing of organic perovskite films deposited on ZnO ALEX ZAKHIDOV, CHRIS MANSPEAKER, DMITRY LYASHENKO, Texas State University, ALEX ZAKHIDOV TEAM — Zinc oxide (ZnO) is a promising semiconducting material to serve as an electron transport layer (ETL) for solar cell devices based on organo-halide lead perovskites. ZnO ETL for perovskite photovoltaics has a combination of attractive electronic and optical properties: i) the electron affinity of ZnO is well aligned with valence band edge of the $CH_3NH_3PbI_3$, ii) electron mobility of ZnO is >1 $cm^2/(Vs)$, which is a few orders of magnitude higher than that of TiO_2 (another popular choice of ETL for perovskite photovoltaic devices), and iii) ZnO has a large of band gap of 3.3 eV, which ensures optical transparency and large barrier for the hole injection. Moreover, ZnO nanostructures can be printed on flexible substrates at room temperatures in cost effective manner. However, it was recently found that organic perovskites deposited on ZnO are unstable and readily decompose at >90C. In this work, we further investigate the mechanism of decomposition of $CH_3NH_3PbI_3$ film deposited on ZnO and reveal the role of the solvent in the film during the annealing process. We also develop a restricted volume solvent annealing (RVSA) process for post annealing of the perovskite film on ZnO without decomposition. We demonstrate that RVSA enables reliable perovskite solar cell fabrication.

Alex Zakhidov
Texas State University

Date submitted: 07 Nov 2015 Electronic form version 1.4