Abstract Submitted
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Investigation of transport properties of ZnO/PbS heterojunction solar cells[1] YANG CHENG, MICHAEL D. C. WHITAKER, VINCENT R. WHITESIDE, LLOYD A. BUMM, IAN R. SELLERS, Department of Physics Astronomy, University of Oklahoma, Norman OK 73019 — Lead sulfide (PbS) and lead selenide (PbSe) colloidal quantum dots (CQDs) are considered as a potential candidate material for solar cell applications due to their large band gap tunability range (0.5 to 1.7 eV) and cost-effective solution based processing. A series of Glass/ITO/ZnO/PbS/MoO_3/Au heterojunction solar cells were processed and analyzed. A stable (reproducible) 2% conversion efficiency under 1-sun is achieved based on the result of $J-V$ measurements. Absorbance and external quantum efficiency (EQE) measurements clearly show photo-generated carrier extraction from PbS active layers in the solar cell. However, a non-ideal $J-V$ behavior is observed in current-voltage measurements. This behavior may be attributed to a high density of trap states at the QD surface or defect states at the PbS/ZnO or ITO/ZnO interfaces. C-V and Impedance spectroscopy measurements are used to study this unusual behavior. These techniques could also help probe the transport properties and limitation of these heterojunction solar cells.

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