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Time Resolved Photoluminescence Studies of ZnO and Zn_2SnO_4 Nanowires for Solar Cells Applications[1] BAICHHABI RAJ YAKAMI, MEG MAHAT, Department of Electrical Engineering, University of Wyoming, JIAJUN CHEN, LIYOU LU, WENYONG WANG, Department of Physics and Astronomy, University of Wyoming, JON M. PIKAL, Department of Electrical Engineering, University of Wyoming — Sensitized nanowires (NWs) are a promising option for solar cells. They serve as the support structure for the absorbing centers, provide interfacial charge separation, and transport to the anode. Most work has focused on binary oxides, but ternary oxides have advantages due to flexibility in the properties of the oxide. Here we report on the photoluminescence (PL) and Time Resolved PL (TRPL) of Zinc oxide (ZnO) and Zinc Tin Oxide (ZTO) NWs grown by Chemical Vapor Deposition. The ZnO NWs show strong band gap emission and weak but resolvable defect emission peaks. The PL from the ZTO NWs does not show any band gap emission and absorption measurements confirm that these NWs have a direct forbidden transition. The ZTO NWs do have a board visible emission peak, which is usually attributed defects and oxygen vacancies. TRPL of the band gap emission in ZnO NWs yield a carrier lifetime of 1.4ns. The TRPL of the defect peaks in ZTO NWs are more complicated, showing a multi-exponential decay but with an overall decay rate similar to the ZnO NWs. This indicates that the expected increase in carrier lifetime in the ZTO NWs is not currently realized likely due to defect recombination, and additional optimization of the NW growth process may yield improved performance.

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