Abstract Submitted
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Designing the bandgap of ZnO via Alloying of Magnesium and Sulfur[1] JESSE HUSO, DINESH THAPA, HUI CHE, AMRAH CANUL, Department of Physics, University of Idaho, CALEB COROLEWSKI, M.D. MCCLUSKEY, Department of Physics,Washington State University, LEAH BERGMAN, Department of Physics, University of Idaho — ZnO is emerging as one of the materials of choice for UV applications. It has a benign chemical nature, a deep excitonic energy level, and a direct bandgap of 3.4 eV. The latter two properties make ZnO a highly efficient light-emitter at and above room temperature. Alloying ZnO with magnesium and sulfur creates the $Mg_xZn_{1-x}O$ and ZnS_xO_{1-x} alloy systems which can tune the bandgap by design and add new optical and electronic functionalities to ZnO. In $Mg_xZn_{1-x}O$, annealing studies were performed to overcome the phase segregation tendency, reduce intrinsic defects, and enhance the UV luminescence. It was found that annealing under an argon environment significantly improved the material and optical properties of the films due to the removal of intrinsic defects and completion of alloying. In ZnS_xO_{1-x}, phase segregation is expected to occur during growth due to the various crystal structures of end members and large difference in anion radii of S and O. However, this alloy system may form intermediate compounds such as zinc sulfate ($ZnSO_4$) which significantly impact material and optical properties. The removal of undesirable compounds will be discussed in terms of the growth conditions.

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