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Photoluminescence Characteristics of Pulsed Laser Deposited ZnO Thin Films Grown in Nitrogen/Oxygen Ambients M.A. THOMAS, J.B. CUI, Y.C. SOO, H. KANDEL, T.P. CHEN, University of Arkansas-Little Rock, C.P. DAGHLIAN, Dartmouth College — ZnO thin films were grown by pulsed laser deposition using a Zn target in different atmospheres. The samples were characterized by SEM, XRD, EDX, and temperature dependent photoluminescence (PL) measurements. The growth conditions were varied sequentially from a pure oxygen to a pure nitrogen atmosphere, and the resulting changes of the material properties were investigated. The presence of nitrogen during growth was found to have a strong impact on the materials. Samples grown with higher nitrogen concentrations showed weak PL characteristics at room temperature as well as a small temperature dependence of the near band edge emission. At temperatures below 40 K, a sharp and pronounced emission peak was present at 3.362 eV. In an attempt to understand the PL characteristics, the samples were annealed in both pure oxygen and pure nitrogen environments at 600 $^\circ$C. The samples grown with large nitrogen ratios exhibited a strong dependence on the annealing atmosphere; those annealed in nitrogen showed a strong increase in emissions in the 3.362 eV range compared to the same samples annealed in oxygen. In addition, the defect emissions of the samples were strongly affected by the presence of nitrogen during annealing. The possible role of nitrogen in ZnO growth and annealing is discussed.

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