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Time Resolved Photoluminescence Measurements in hexagonal $Mg_xZn_{1-x}O$ (x=0.13) alloys SHIVA HULLAVARAD, R. VISPUTE, S. DHAR, University of Maryland, HENRY EVERITT, JOHN FOREMAN, Duke University, I. TAKEUCHI, University of Maryland — In this work we present results on the optical characterization of Pulsed Laser Deposited epitaxially grown thin films of $Mg_xZn_{1-x}O$ on sapphire. The crystalline quality and composition of the alloys are characterized by X-Ray Diffraction and Rutherford Back Scattering (RBS) – ion channeling techniques respectively. The composition of the films is found to have strong dependence on the growth parameters. The photo generated carrier decay times are analyzed by time-resolved photoluminescence (TRPL) measurements. Since most optical and electrical devices are operated at room temperature, understanding the fundamental excess carrier recombination dynamics at 300 K is required to evaluate the relevant radiative and non-radiative recombination mechanisms and thus to improve the performance of devices. We have observed from initial PL measurements evidence of varying amounts of non-radiative relaxation processes competing with radiative PL in the MgZnO samples. More importantly, we have observed a decay time of 125 ps for films from TR-PL measurements. The efficiency of the radiative recombination, and therefore the material quality, is strongly related to the decay time of the particular transition. The correlation of the results obtained from RBS and PL-TRPL measurements will be presented.

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