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An Analysis of the Defects on ZnO and $Zn_{0.95}Mn_{0.05}O$ Thin Film Grown by Pulsed Laser Deposition

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Wide-bandgap semiconductors such as GaN, ZnO and 6H-SiC have been widely investigated for their applications to ultraviolet (UV) light emitters and high-power and high-temperature electronics due to theirwide-bandgap nature and high breakdown electric fields. Recently, an attention to ZnO is growing rapidly because of its advantages over GaN including availability in bulk and much higher exciton binding energy (60 meV) compared with GaN (24 meV) which guarantees a stability of exictonic emission mechanisms above room temperature.Especially, the ZnO has much interesting for a based material for the diluted magnetic semiconductor, because of its theoretical high Curie temperature.

In this study, ZnO and $Zn_{0.95}Mn_{0.05}O$ films were grown by pulsed laser deposition (PLD) on sapphire substrates at some varied temperature between from 200 K to 700 K. The defects in the ZnO and $Zn_{0.95}Mn_{0.05}O$ films were investigated by using deep level transient spectroscopy (DLTS) and photoluminescence measurements. For the DLTS measurement, Ti/Au was deposited over the large area of the sample to form an Ohmic contactand we had deposited Al_2O_3 layer on the films for making metal-insulator-semiconductor structure. On the prepared sample the DLTS measurements were performed at temperature range from 20 K to 370 K. Finally, a temperature dependent photoluminescence also measured.