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**Epitaxial Zinc Oxide Semiconductor Film deposited on Gallium Nitride Substrate**[1] MICHAEL MCMASTER, TOM ODER, Youngstown State University — Zinc oxide (ZnO) is a wide bandgap semiconductor which is very promising for making efficient electronic and optical devices. The goal of this research was to produce high quality ZnO film on gallium nitride (GaN) substrate by optimizing the substrate temperature. The GaN substrates were chemically cleaned and mounted on a ceramic heater and loaded into a vacuum deposition chamber that was pumped down to a base pressure of 3 x $10^{-7}$ Torr. The film deposition was preceded by a 30 minute thermal desorption carried in vacuum at 500 °C. The ZnO thin film was then sputter-deposited using an $O_2$/Ar gas mixture onto GaN substrates heated at temperatures varying from 20 °C to 500 °C. Post-deposition annealing was done in a rapid thermal processor at 900 °C for 5 min in an ultrapure $N_2$ ambient to improve the crystal quality of the films. The films were then optically characterized using photoluminescence (PL) measurement with a UV laser excitation. Our measurements reveal that ZnO films deposited on GaN substrate held at 200 °C gave the best film with the highest luminous intensity, with a peak energy of 3.28 eV and a full width half maximum of 87.4 nm. Results from low temperature (10 K) PL measurements and from x-ray diffraction will also be presented.

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