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Optical properties of non-polar ZnO using Terahertz time domain spectroscopy MING-YEN CHUANG, SHU-YU YAO, DER-JUN JANG, QUARK Y. CHEN, Department of Physics, Natl Sun Yat Sen Univ — The m-plane ZnO thin films grown on m-plane sapphire substrates by atomic layer deposition were investigated with the terahertz time domain spectroscopy. The terahertz emission was generated by exciting a LT-GaAs antenna with laser pulses from Ti:sapphire at the wavelength of 800 nm. One of the ZnO samples was thermally annealed with a rapid thermal annealing system with O_2 at a temperature of 700 ^{o}C. The other ZnO sample was studied without annealing. The refractive indices and extinction coefficients of m-plane ZnO along c- and a-axis were derived and found significant different. For both samples, the extinction coefficient and refractive index decreases monotonically with frequency. While the mobility along a-axis was found about the same after annealing, the mobility along c-axis has been improved significantly due to annealing. The annealing treatment has shown its impact on reducing the carrier concentration of 4.5 x 10^{19} to 3.5 x 10^{18} cm^{-3} for unannealed and annealed ZnO, respectively.

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