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Thermal electron capture rate by Fe acceptor in GaN J. DASHDORJ, M.E. ZVANUT, University of Alabama at Birmingham, T. PASKOVA, K. UDWARY, Kyma Technologies, Inc. — Doping GaN with Fe compensates the main residual impurities such as O and Si to produce semi-insulating substrates. Electron paramagnetic resonance measurements were made on GaN grown by hydride vapor phase epitaxy and doped with 1.5x10^{17} to 1.6x10^{18} cm^{-3} Fe. The Fe^{3+} spectra, angular dependence, and concentrations are consistent with literature and secondary ion mass spectroscopy data. During illumination with photon energies greater than 1.2 eV, the Fe^{3+} signal increased in the lowest doped sample, but decreased in the more highly doped samples. One possible interpretation of the results is that the $Fe^{2+/3+}$ and $Fe^{3+/4+}$ levels are about 1.2 eV below the conduction band. Due to our measurement resolution, the spectral separation between the levels cannot be determined. The time-dependence of the Fe^{3+} signal recovery after removal of 2.64 eV was recorded at temperatures between 3.5 and 297 K. Analysis show that capture rate of electrons by Fe^{3+} decreases from 6x10^{-16} to 5x10^{-17} cm^3/s with an inverse-square-root temperature dependence. The work is supported by the NSF.

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