Abstract Submitted
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Charge Transfer in Compensated GaN:Be Substrates Observed with Magnetic Resonance[1] WILLIAM WILLOUGHBY, MARY ELLEN ZVANUT, JAMIYANAA DASHDORJ, University of Alabama at Birmingham, MICHAL BOCKOWSKI, Institute of High Pressure Physics, Warsaw, Poland — GaN:Be layers are used for electrical isolation, and the broad Be-related yellow luminescence (YL) may be used for white-light production. To understand this behavior, we investigate charge transfer using photo-induced electron paramagnetic resonance (EPR). GaN substrates grown from Ga solution under high N pressure (HNPS) and doped with 10^{19} O/cm^3 and 10^{17} to 10^{19} Be/cm^3 were studied using time-dependent photo-EPR at 3.5 K. Excitation with E_{ph} >2.6 eV increased EPR amplitude, while subsequent illumination with E_{ph} >1 eV quenched EPR. A charge transfer model fit to the data included electron-excitation, capture onto ionized donors and neutral acceptors, and recombination of neutral donors and acceptors. The spectral dependence of the optical absorption cross-section of the negative charge state (A^-) of a Be-related acceptor revealed an acceptor level E_V + 0.7 eV and structural relaxation of 0.5 eV for the $A^- \rightarrow A^0 + e^-_{CB}$ transition. Preliminary analysis of quenching suggests an acceptor level at E_V + 1 eV and a relaxation of 1 eV for $A^0 + e^-_{VB} \rightarrow A^-$. The deep acceptor level provides an explanation for the efficacy of Be in producing resistive substrates and for the YL mechanism used for light conversion.

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