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The origin of the high hole density in $In_xGa_{1-x}N$:Mg[1] WILLIAM WILLOUGHBY, MARY ELLEN ZVANUT, University of Alabama at Birmingham — InGaN is the nitride of choice for applications requiring high hole density and emission tunability. The increased hole density with In incorporation may be explained by several different mechanisms; however, our electron paramagnetic resonance (EPR) studies reveal a surprising feature: the number of Mg-related acceptors decreases with increasing hole density. $In_xGa_{1-x}N$ films, with x between 0.02 and 0.11 and thickness between 0.25 and 0.44 μm, were grown p-type by doping with Mg to a concentration of 2-3 $\times$ 10^{19} cm^{-3}. Hall measurements reveal the expected hole density increase from 5-30x10^{17} cm^{-3} with increasing In mole fraction. However, unlike GaN:Mg where the EPR Mg signal tracks the hole density, the EPR intensity of the Mg-related signal in InGaN is found to decrease as the hole density increases. Together, compensating defects and a lowering of the acceptor level may explain the decrease in EPR intensity and the increase in hole density observed as the In mole fraction is increased.

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