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**P-type InGaN alloys** D.M. YAMAGUCHI, R.E. JONES, N.R. MILLER, E.E. HALLER, U.C. Berkeley, Berkeley CA, 94720.; Berkeley Lab, Berkeley CA, 94720. J.W. AGER, K.M. YU, W. WALUKIEWICZ, Berkeley Lab, Berkeley CA, 94720. H. LU, W.J. SCHAFF, Dept. of Electrical and Computer Engineering, Cornell University, Ithaca, NY — We have demonstrated via electrolyte-based capacitance-voltage (CV) measurements that a set of Mg-doped In$_{1-x}$Ga$_x$N thin films ($x=.05,.30,.33,$ and .80) exhibit bulk p-type activity. There is a change in the slope of the Mott-Shockley plots of In$_{1-x}$Ga$_x$N with $x \leq .33$ which is consistent with p-type bulk material underneath an n-type surface inversion layer. In contrast, CV analysis of Mg-doped In$_{0.2}$Ga$_{0.8}$N indicates p-type activity throughout the film. These results are consistent with surface Fermi level pinning at ~4.9 eV with respect to the vacuum level. Based on the known valence band offsets between GaN and InN, a surface inversion layer is predicted for In$_{1-x}$Ga$_x$N with $x \leq .66$ and a surface Schottky barrier for $x > .66$. These results provide the first evidence of p-type doping of InGaN alloys in the whole composition range.

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