Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

Reduction of the Specific Contact Resistance in p-type GaN-based Devices via Polarization Doping.[1] JACOB MELBY, JASON GU, LI HUANG, Carnegie Mellon, YUHRENN WU, LISA PORTER, ROBERT DAVIS, Carnegie Mellon — The power efficiency of GaN-based devices is sensitive to energy loss at p-type semiconductor contacts. Low resistance contacts to p-type GaN are difficult to achieve due to limitations in extrinsic acceptor doping. These limitations can be avoided via polarization doping. Au/Ni contacts deposited on a 2nm thick strained $In_xGa_{1-x}N$ capping layer atop a p-type GaN layer exhibited three orders of magnitude reduction in the specific contact resistance versus the single layer p-type GaN control. Increased band bending near the interface due to the polar field resulted in a reduced tunneling barrier width and a decrease in the specific contact resistance. At a minimum critical capping layer thickness, a two-dimensional hole gas (2DHG) forms in the $In_xGa_{1-x}N$ layer. The effect of the composition and thickness of the capping layer on the specific contact resistance and the hole concentration in a 2DHG has been determined using self-consistent solutions to the Schrödinger and Poisson equations and will be reported in the presentation. The results of these simulations will also be compared with data from electrical measurements on actual $In_xGa_{1-x}N$/GaN heterostructures.

[1]Department of Energy

Jacob Melby
Carnegie Mellon

Date submitted: 28 Nov 2008 Electronic form version 1.4