Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Origin of Persistent Photoconductivity Effect in GaAsN Alloys
YU JIN, HAILING CHENG, RYAN JOCK, CAGLIYAN KURDAK, RACHEL GOLDMAN, University of Michigan — (In)GaAsN alloys with a few percent nitrogen have potential applications in many long wavelength optoelectronic devices. However, the formation of point defects, such as N interstitials and Si-N complexes, has been predicted to substantially limit the optical emission efficiency and minority carrier transport of (In)GaAsN. Here, we report a persistent photoconductivity (PPC) effect associated with N interstitial-related defects in GaAsN films. In our GaAsN films, PPC was observed up to 160K, with a photo-capture barrier of 350 - 400 meV. Meanwhile, low T transport measurements reveal two regimes of carrier concentration, n, a T-independent regime above 150K and a thermally-activated regime below 150K. These two phenomena are reminiscent of the behavior of n-type AlGaAs due to the presence of DX-center levels, suggesting the presence of similar N-induced defect levels in GaAsN. Furthermore, after annealing, the PPC effect is suppressed and n increases substantially. Our recent nuclear reaction analysis revealed that the interstitial N concentration is decreased by RTA. Therefore, the RTA-induced suppression of the PPC and the increase of n in GaAsN suggest their association with N interstitials.

Yu Jin
University of Michigan

Date submitted: 08 Dec 2009 Electronic form version 1.4