Abstract Submitted
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Formation Mechanisms of Embedded Zincblende and Wurtzite Nitride Nanocrystals ADAM WOOD, University of Michigan, X. WENG, Penn State University, Y.Q. WANG, Materials Science & Tech. Division, LANL, R.S. GOLDMAN, University of Michigan — Semiconductor nanocomposites have been proposed for high figure of merit thermoelectrics. A promising approach to nanocomposite synthesis is matrix-seeded growth, which involves ion-beam-amorphization of a semiconductor film, followed by nanoscale re-crystallization via rapid thermal annealing (RTA) [1]. In this work, we are studying the formation and evolution of N ion-implanted InAs and GaAs. Low temperature (77K) N ion implantation into InAs leads to the formation of an amorphous layer with crystalline InAs remnants. RTA at up to 550 $^\circ$C leads to the nucleation of zincblende (ZB) InN nanocrystals (NC). RTA at 600 $^\circ$C leads to nucleation of both ZB and wurtzite (WZ) InN, with an increase in average NC size. These results are consistent with the predictions of a thermodynamic model for the nanoscale-size-dependence for nucleation of ZB and WZ InN. We are also developing a novel approach to *direct* the seeding of nanostructure arrays, using a combination of focused-ion-beam (FIB) implantation and conventional ion implantation. To date, we have demonstrated the selective positioning of WZ and ZB GaN NCs using 75keV and 100keV N implantation, followed by FIB patterning and 800 $^\circ$C RTA. [1] X. Weng, et al, *J. Appl. Phys.* **97,** 64301 (2005).

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