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Investigation of Structural Phase Transitions on Wurtzite Gallium Nitride Surfaces TIANJIAO CHEN, ABHIJIT CHINCHORE, YINGHAO LIU, KANGKANG WANG, WENZHI LIN, ARTHUR SMITH, Nanoscale and Quantum Phenomena Institute, Department of Physics and Astronomy, Ohio University, Athens, OH 45701 — Surface structures of wurtzite gallium nitride (w-GaN) have been investigated previously,[1][2] and it is well known that above 300K there exist order-disorder phase transitions. For N-polar w-GaN (000-1) at 300K, a family of surface reconstructions occurs, including 1×1, 3×3, 6×6, and c(6×12). Not much is known, however, about what happens to these structures as they are cooled below 300K. We have recently developed a new epitaxy/analysis system, including a sample stage which can be both heated and cooled. The N-polar w-GaN surfaces are prepared using rf N-plasma-assisted molecular beam epitaxy, and monitored in-situ using reflection high energy electron diffraction (RHEED). The approach is to monitor the [11-20] and [10-10] RHEED diffractions during cryogenic cooling, starting with the 1×1 or 3×3 structures. A critical issue to explore is the interrelationship between surface gallium concentration and structural deformation. This study may provide the missing link to new reconstructions of w-GaN recently observed using LT scanning tunneling microscopy.[3] This work is supported by NSF (Grant No. 0730257). [1] A. R. Smith et al., Phys. Rev. Lett. **79**, 3934 (1997). [2] A. R. Smith et al., Surface Science **423**, 70 (1999). [3] D. Acharya, S.-W. Hla et al., unpublished.

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