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Investigation of Cooling-Induced Phase Transitions of the Surface Structure of w-GaN(000-1) and (0001) TIANJIAO CHEN, KANGKANG WANG, YINGHAO LIU, KENDAL CLARK, DANDA ACHARYA, MUHAMMAD HAIDER, ARTHUR SMITH, SAW-WAI HLA, Ohio University — It is well-known that the surface structure of wurtzite GaN at room temperature consists of multiple reconstructions which depend on both the surface Ga coverage as well as the wurtzite polarity. In this study we investigate the phase transitions of the surface as it is cooled from room temperature down to as low as 190 K. The experiment consists of growth of the GaN using radio frequency plasma molecular beam epitaxy and monitoring the surface using reflection high energy electron diffraction. For GaN layers grown on sapphire (0001), both 5/12 and 7/12 streaks were observed after cooling the as-grown sample down to 255 K. In order to make a connection between a specific room-temperature reconstruction and these observed low-temperature RHEED patterns, we are carrying out a systematic study by preparing both N-polar and Ga-polar surfaces having specific amounts of Ga coverage as the starting points. Initial results show differences depending on the surface treatment. An additional goal of these studies is to explain a set of novel reconstructions seen in LT-STM images at 77K and 4.6 K. Authors acknowledge support by NSF (grant Nos. 0304314 and 0730257).

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