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Direct observation of frozen gallium gas on wurtzite gallium nitride (000$\underline{1}$) using low-temperature scanning tunneling microscopy KHAN ALAM, ANDREW FOLEY, WENZHI LIN, JOSEPH CORBETT, YINGQIAO MA, JEONGIHM PAK, ARTHUR SMITH, Nanoscale and Quantum Phenomena Institute, Ohio University, Athens, OH — Gallium nitride layers are ordinarily grown under gallium-rich growth conditions by molecular beam epitaxy (MBE) to obtain the highest material quality. In 1997, Smith *et al.* reported the family of reconstructions existing on the growth surface at room temperature, the highest-order being the c(6x12).[1] Additional gallium deposition does not lead to new reconstructions. Instead, excess gallium atoms are presumed to exist in a 2-dimensional gas state. Using a custom-built MBE/low-temperature (4.2 K) STM system, we have imaged this gallium gas for the first time by freezing out the motion. The frozen-out gallium atoms are visualized as asymmetric 'L-shaped' features, with left-handed and right-handed L's scattered randomly across the surface. Interestingly, on any given atomic terrace we observe a 4x greater probability of left-handed versus right-handed L's (or vice versa), which inverts across bilayer-height steps. The cause of this asymmetry is explored by zooming in with atomic resolution, revealing two inequivalent adsorption sites. [1] A. R. Smith *et al.* Phys. Rev. Lett., **79**, 3934 (1997).

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