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Schottky Barrier Transport for Multiphase Gallium Nitride Nanowire STEVEN HARTZ, KAN XIE, ZHUN LIU, VIRGINIA AYRES, Michigan State University — Our group has shown that gallium nitride nanowires grown by catalyst-free vapor deposition at 850°C have multiple internal crystalline regions that may be zinc blende or wurtzite phase. Stability is enabled by one or more totally coherent (0001)/(111) internal interfaces. Cross-section HRTEM has further demonstrated that, while the transverse nanowire profile appears triangular, it is actually made up of two or more surface orientations corresponding to the multi-phase internal regions. We present results of a transport investigation of these multiphase nanowires within a nanoFET circuit architecture, focusing on injection from the contacts into the nanowires. Experimental results demonstrated that a variety of surface state derived Schottky barriers could be present at the contact-nanowire interfaces. Transport across the Schottky barriers was modeled using a combined thermionic emission-tunnelling approach, leading to information about barrier height, carrier concentrations, and expected temperature behavior. The experimental and theoretical results indicate that with optimal design taking surface and internal structures into account, high current densities can be supported.

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