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Aligned Gallium Nitride Nanowire Growth by Chemical Beam Epitaxy Method RYAN MUNDEN, App Phys, Yale Univ, ALEKSANDAR VACIC, ERIK CASTIGLIONE, WEIHUA GUAN, Elec Eng Yale Univ., CHRISTINE BROADBRIDGE, Physics, Southern CT State Univ, MARK REED, EE/AP Yale University — Gallium Nitride (GaN) Nanowires (NWs) have successfully been grown via a chemical beam epitaxy method. Source gases of Trimethylgallium (TMGa) and Ammonia (NH3) are impinged directly onto a hot growth substrate ($\sim$800 $^\circ$C) in high vacuum ($\sim$1x10^{-8} torr, base; $\sim$1x10^{-5} torr, growth). A thin metal film acts as catalyst, but NWs were also grown without catalyst. By this method NWs have been grown on silicon, alumina, sapphire, and GaN-film substrates. NWs grown on GaN films grow aligned to the growth substrate, perpendicular to the c-plane GaN film surface. Wires aligned to the GaN a-planes can also be observed. NWs have been studied by SEM, TEM, and electrical characterization. NW lengths are $\sim$2.5 micron with diameters of $\sim$25 nm. NWs are uniform, straight, and aligned with the substrate over large areas. However closer inspection of the NWs by TEM shows that the NWs are often polycrystalline in nature. There are distinct segments "stacked" into a nanowire leading to noticeable diameter variations on the nanoscale. Diameter modulation can be enhanced through choice of growth substrate, temperature, and pulsing of the TMGa source.

Ryan Munden
Applied Physics, Yale University

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