# Achieving Atomically Ordered GaN/AlN Quantum Heterostructures: The Role of Surface Polarity

Yuanpeng Wu[1], Peng Zhou[1], Yixin Xiao[1], Kai Sun[2], Ding Wang[1], Ping Wang[1], and Zetian Mi*[,1]
1) Department of Electrical Engineering and Computer Science, University of Michigan, Ann Arbor, MI 48109, USA
2) Department of Materials Science and Engineering, University of Michigan, Ann Arbor, MI 48109, USA
*Corresponding author: ztmi@umich.edu

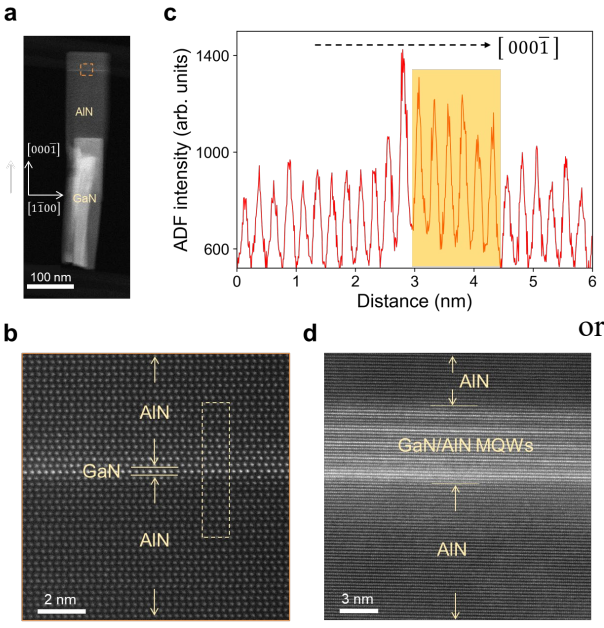


**Figure 1. Structural characterization of GaN/AlN quantum heterostructures on *c*-plane.** (a) Low-magnification HAADF-STEM image of monolayer GaN incorporated on the *c*-plane of an AlN nanowire. (b) High-resolution HAADF-STEM image of the orange-boxed region in (a). The ML GaN as well as the AlN barriers are indicated by the arrows. (c) ADF intensity analysis of the yellow-boxed region in (b). The yellow-shaded region indicates the cation intermixing region. (d) HAADF-STEM image of GaN/AlN digital alloys of 2 MLs GaN/6 MLs AlN (Sample A2).

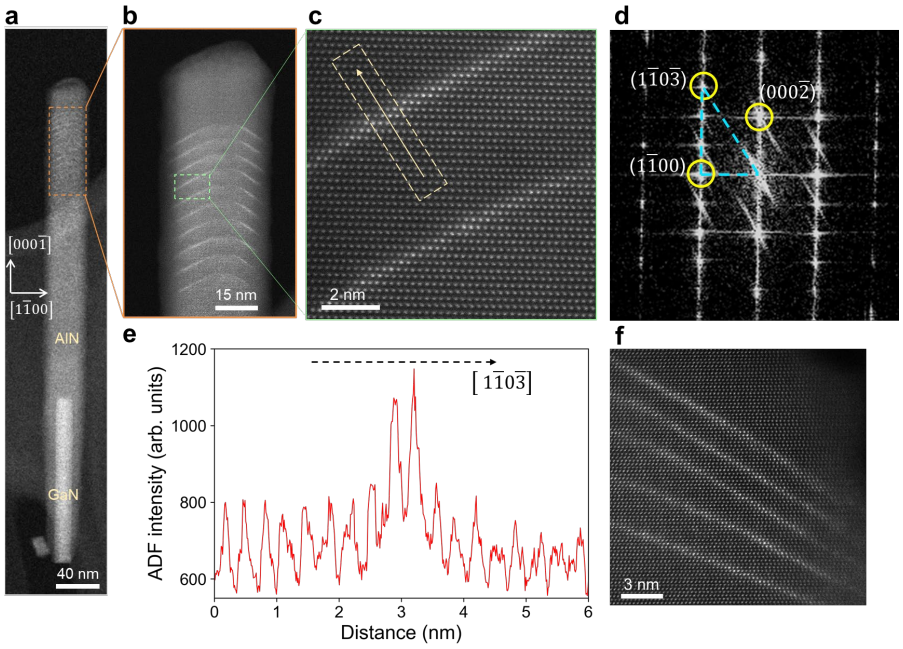

**Figure 2. Structural characterization of GaN/AlN quantum heterostructures on the semipolar plane.** (a) Low-magnification HAADF-STEM image of 10 periods of GaN/AlN digital alloys embedded in an AlN nanowire. (b) HAADF-STEM image of the orange-boxed region in (a). (c) High-resolution HAADF-STEM image of the green-boxed region in (b). (d) Fast Fourier transform of (c). (e) ADF intensity analysis of the yellow-boxed region in (c). (f) HAADF-STEM image of the active region of Sample B2 consisting of 2 MLs GaN/6 MLs AlN.