

Supporting Information

High-quality GaN epilayers achieved by facet-controlled epitaxial lateral overgrowth on sputtered AlN/PSS templates

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1. X-ray rocking curve scan for sample C

The crystal quality of sample C was characterized by high-resolution x-ray diffraction (HRXRD) rocking curve (RC) scan. The result is shown in Figure S1. The full width of half maximums (FWHMs) for (002) and (102) reflections were 140 and 119 arcsec, respectively.

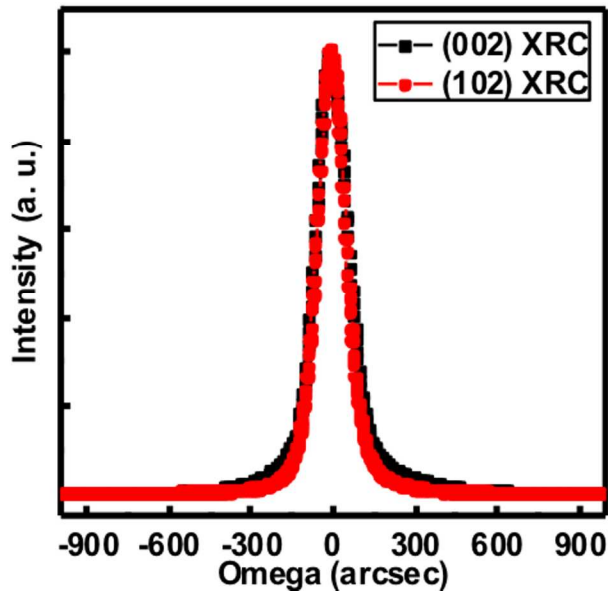


Figure S1. X-ray rocking curves of sample C at (002) and (102) reflections

2. Illustration of different facets

For epitaxy of GaN film, there are four main facet groups. They are (0001) plane, {1-100}, {11-22}, and {1-101}, respectively, as shown in Figure S2. The facet structure of GaN epilayer will vary under different growth conditions.

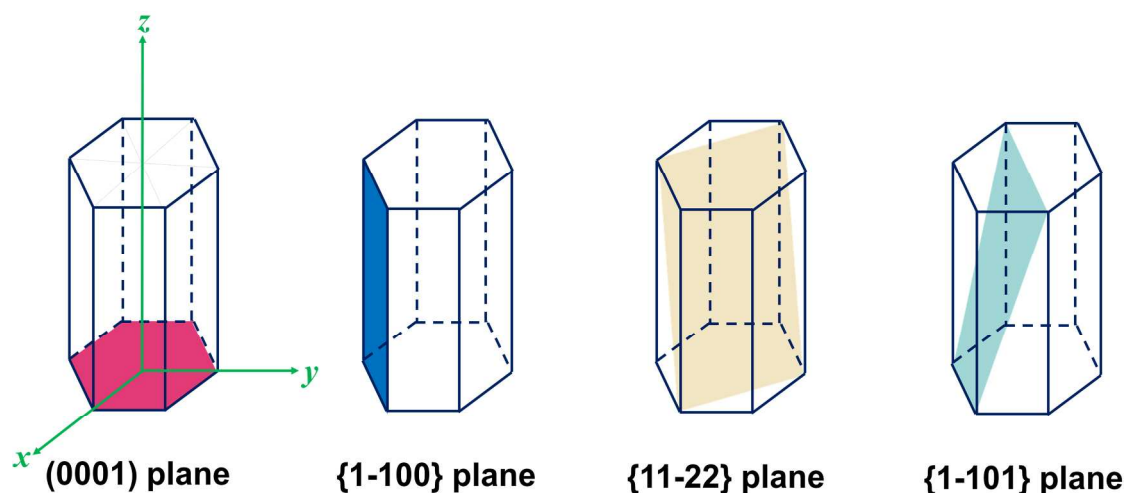


Figure S2. Illustration of (0001), {1-100}, {11-22}, and {1-101} plane orientations with respect to a non-primitive hexagonal GaN unit cell. The angle between {11-22} and (0001) planes is 58.4° . The angle between {1-101} and (0001) planes is 62.0° .

3. In-situ curvature monitoring of GaN epilayers grown on different buffers

For GaN epilayers grown on different buffer layers, the stress states were quite different. As shown in Figure S3, GaN epilayer grown on MOCVD GaN buffer layer bore obvious tensile stress. In comparison, GaN epilayer grown on sputtered AlN buffer layer bore compressive stress. The compressive stress in GaN epilayer will benefit the subsequent growth of AlGaIn.

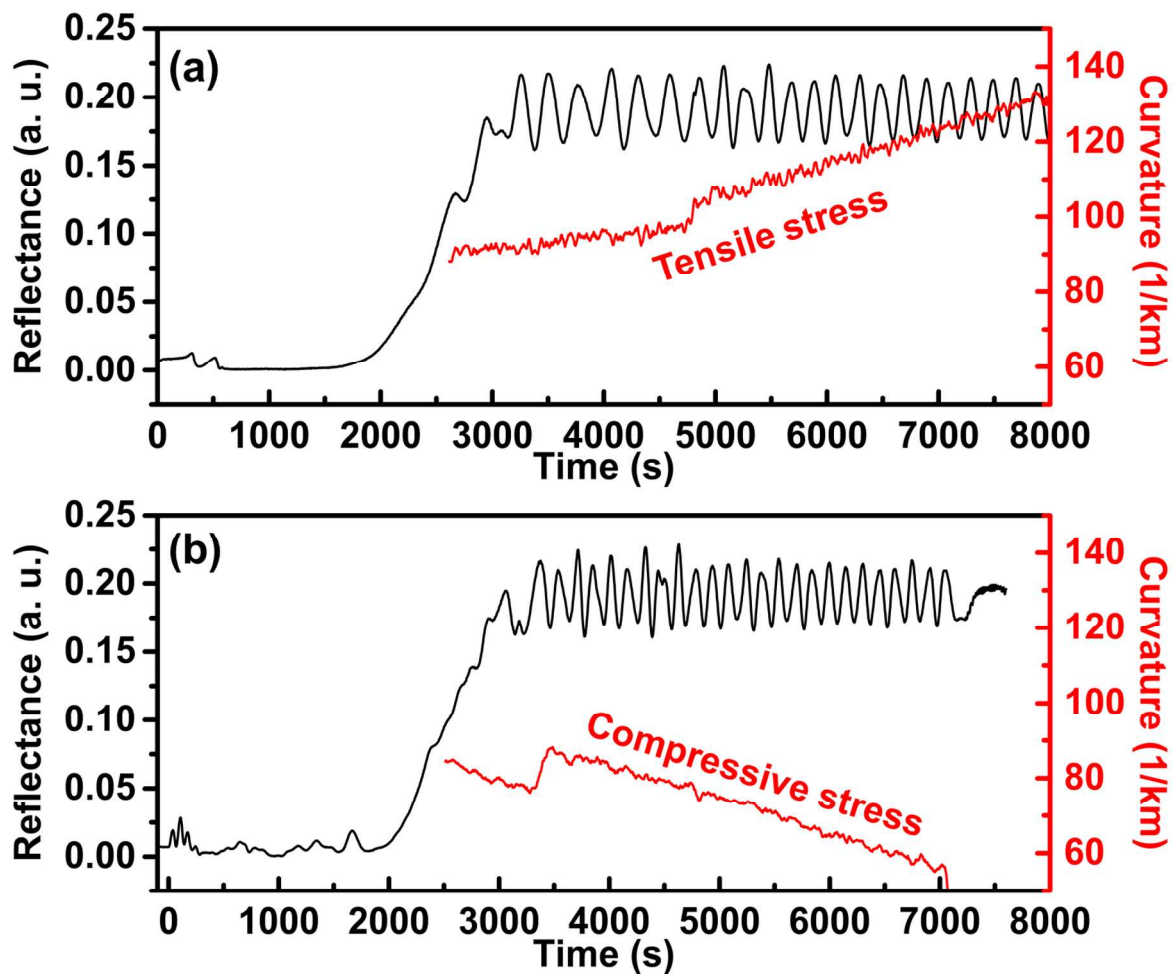


Figure S3. (a) In-situ curvature monitoring of GaN epilayer grown on PSS using MOCVD GaN buffer. (b) in-situ curvature monitoring of GaN epilayer grown on PSS using sputtered AlN buffer.

