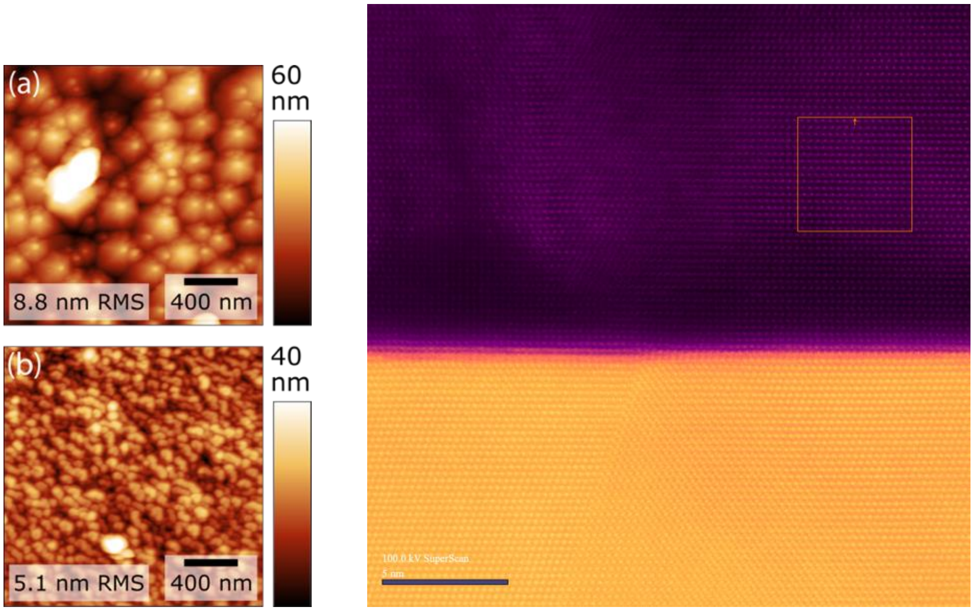
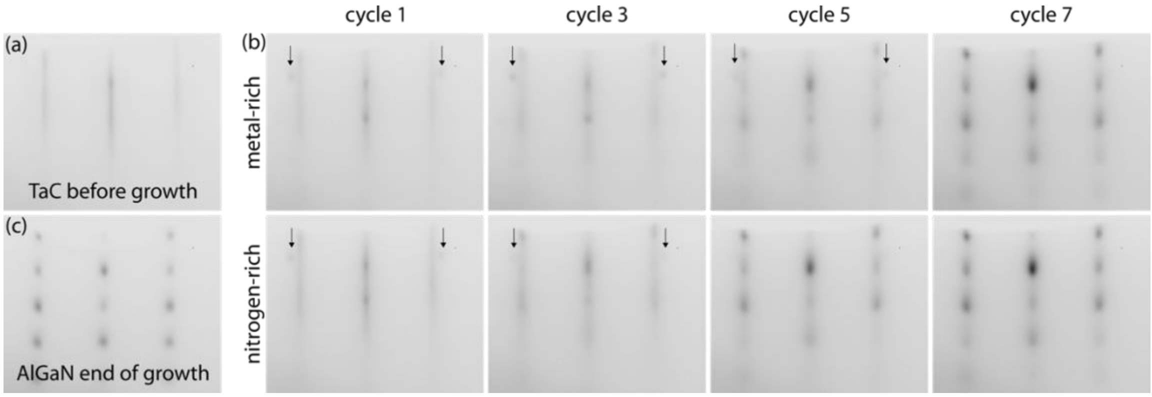
Supplemental Material



(left) AFM of Al$_{0.7}$Ga$_{0.3}$N grown on TaC (a) and AlN (b) showing spiral hillocks indicative of step-flow growth and a large dislocation density. (right) STEM image of a defect propagating from TaC to AlGaN



RHEED images of Al$_{0.7}$Ga$_{0.3}$N nucleation on TaC. (a) shows the streaky-smooth TaC surface before growth. (b) shows RHEED captures from the first few cycles of metal-modulated epitaxy. The arrows point to an incommensurate spot which is more pronounced in metal-rich conditions and is not seen after 7 cycles. (c) shows the AlGaN at the end of growth.