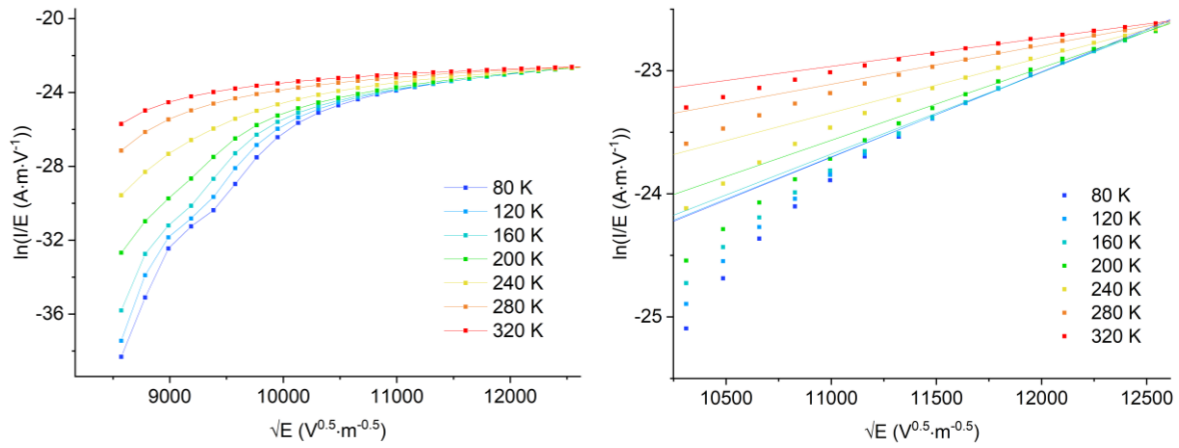

Fig. S1: Frenkel-Poole emission plot for sample annealed at 700 °C for 30 s. The zoom shows some degree of linearity, but there is greater deviation from linear than observed for Fowler-Nordheim tunnelling, and strong non-linearity across the voltage range. There is also a very clear temperature dependence across the measured range.

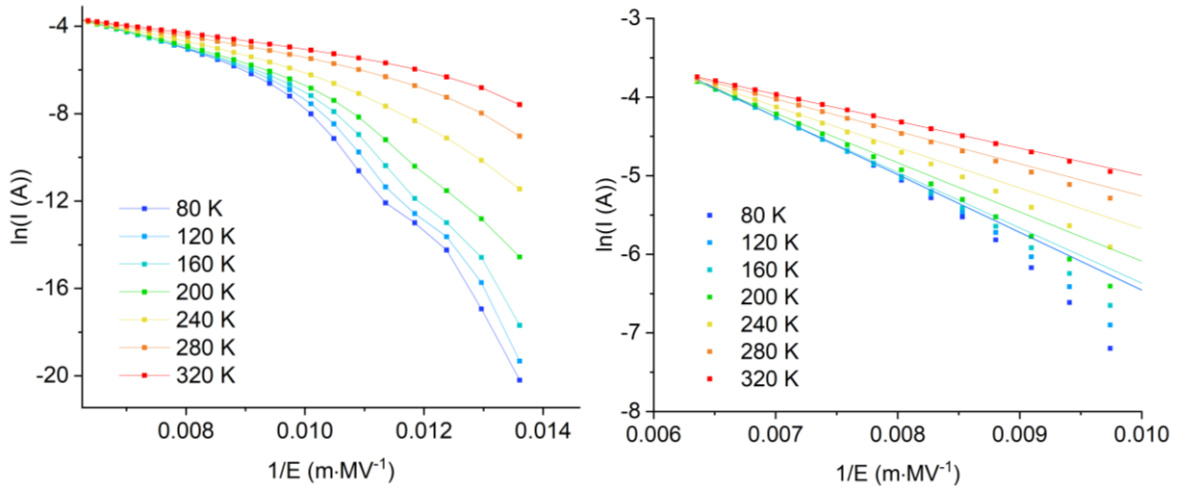

Fig. S2: Trap-assisted tunnelling plot for sample annealed at 700 °C for 30 s. The zoom shows some linearity, up to $\frac{1}{E} \approx 0.008$ m MV^{-1}, compared to the threshold of 0.0085 m MV^{-1} identified for Fowler-Nordheim tunnelling in the main manuscript. Significant dependence on both field and temperature can be seen.

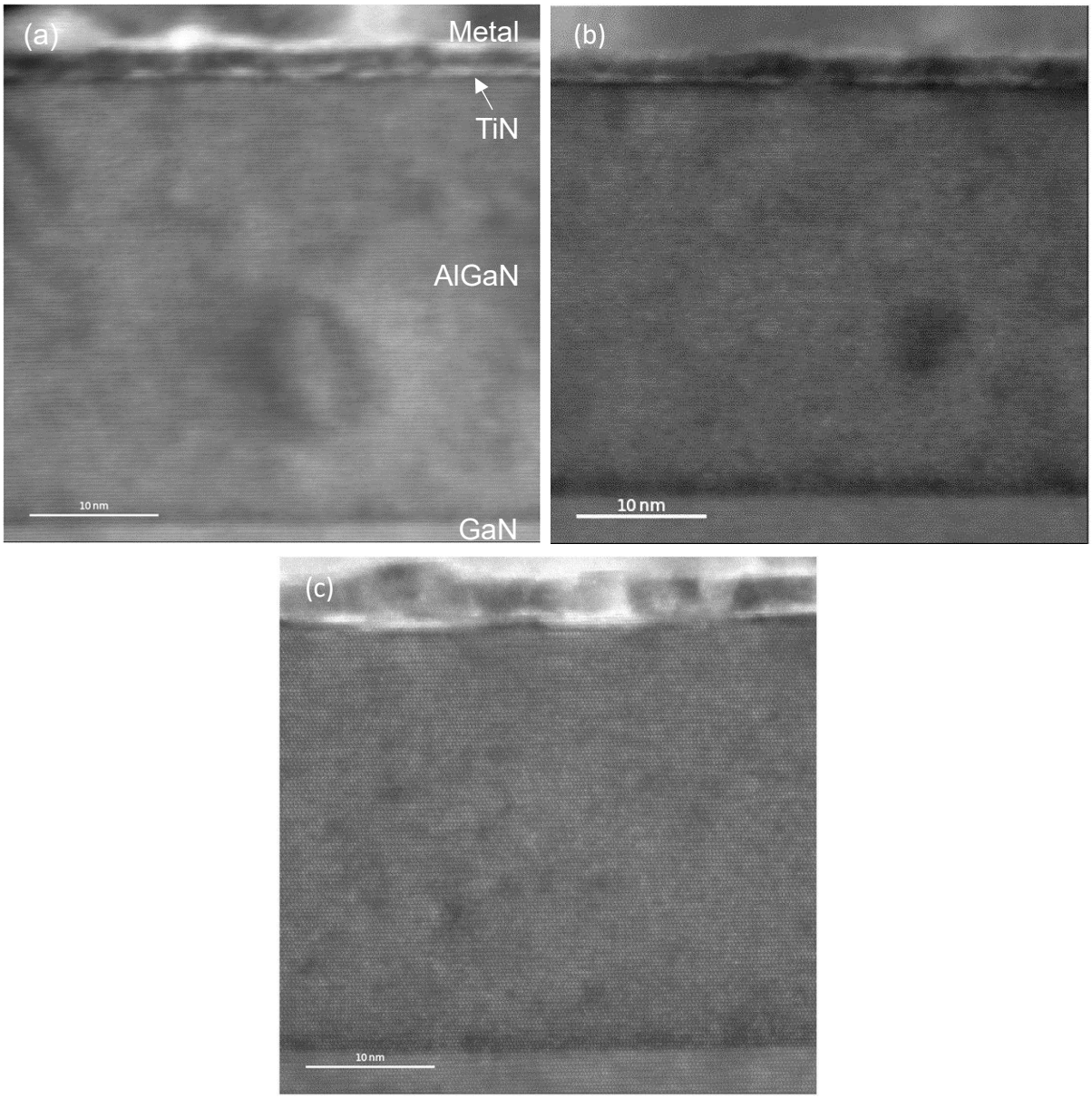

Fig. S3: HR-STEM images showing the AlGaN barrier of samples from wafer A annealed at (a) 700 °C, (b) 750 °C and (c) 800 °C for 30 s. There is no significant difference in the thickness or morphology of the AlGaN.