References:

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Figures:

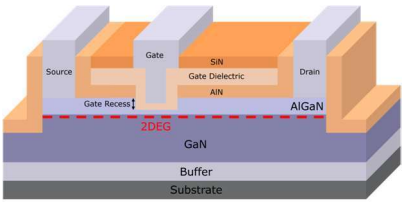

Fig. 1 Simplified AlGaN-GaN MIS-HEMT structure detailing gate recess and AlGaN-GaN interface with 2DEG formation. Controlled etch of AlGaN recess is critical for gate formation and device operational reliability and efficiency.

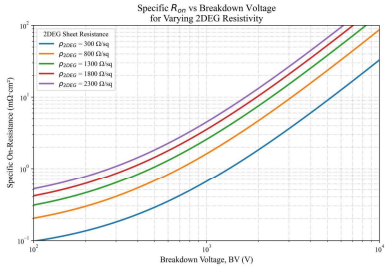

Fig. 2 Modelled on-resistance of a lateral GaN-AlGaN HEMT structure as a function of breakdown voltage for varying 2DEG resistivity. Given that 2DEG resistivity is governed by the AlGaN layer thickness and material properties, careful control over the thickness of the etched AlGaN at the recessed gate of a GaN-AlGaN MIS-HEMT is a priority.

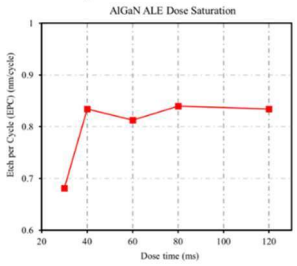

Fig. 3 Dose saturation curve for AlGaN ALE measured using in-situ reflectance endpoint. Plateauing EPC between 40 - 120 ms dose times indicates dose saturation achieved at 40 ms dose time.

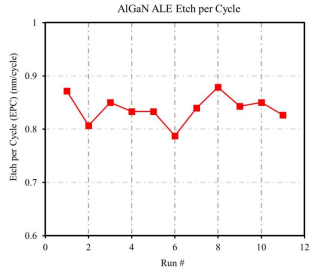

Fig. 4 AlGaN ALE EPC for 11 baseline process runs measured using in-situ reflectance endpoint. Confidence in process repeatability can be drawn from the tight EPC range of 0.79–0.88 nm/cycle, corresponding to a run-to-run uniformity of 5.4%. Planned electrical characterisation of AlGaN layers using Hg-prob analysis should yield cross wafer uniformity.

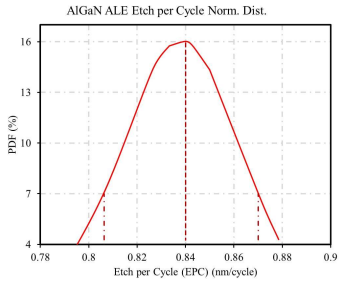

Fig. 5 Normal Distribution of the EPC data. For this set of results the mean EPC is 0.84 nm/cycle, while the standard deviation from the mean is 0.025. The run-to-run uniformity value is ~ 5.4%. The 10th percentile, 90th percentile, and the mean are also represented on the plot.

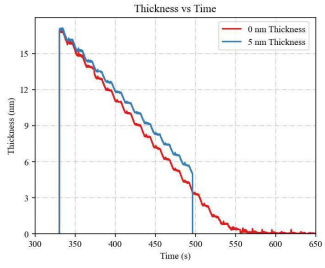

Fig. 6 Plotted example of etch depth vs time for targeted AlGaN etch depths of 5 nm and 0 nm. The ALE etch cycles are clearly visible as steps on the plotted curves. While there appears to be some process drift in the EPC, this is countered by the Etchpoint endpoint etch stop function.

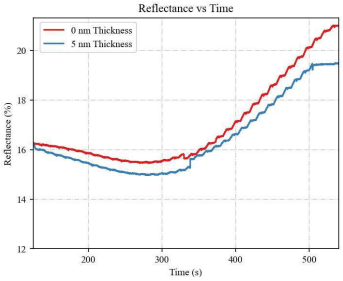

Fig. 7 Plotted Etchpoint AlGaN reflectance data for targeted AlGaN etch depths of 5 nm and 0 nm. Shifts in material reflectance are visible as steps in the curve, as the surface reflectance is altered during dose-etch steps of the EPC.