Influence of Substrate Orientation and Surface Treatments on n-Ga_2O_3/p-GaN Heterointerface Quality

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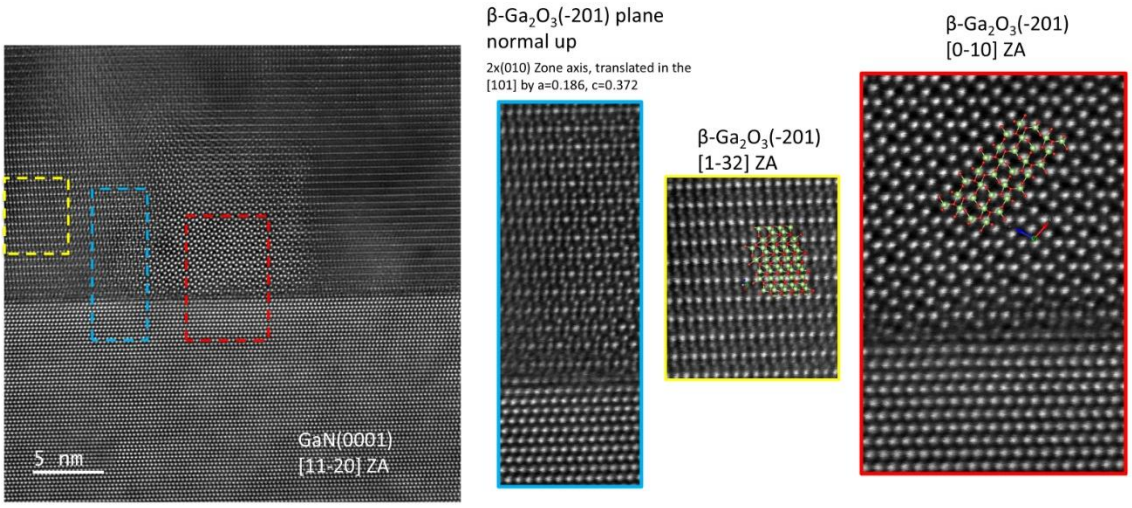

Figure S1: STEM micrographs of an N-polar p-GaN(0001)/n-Ga_2O_3(-201) heterostructure highlighting different rotational domains of Ga_2O_3, with highlighted regions showing Ga_2O_3(-201){1-32}||GaN(0001)[11-20] in yellow, Ga_2O_3(-201){0-10}||GaN(0001)[11-20] in red, and a superposition of overlapping Ga_2O_3(-201){0-10} regions in blue.

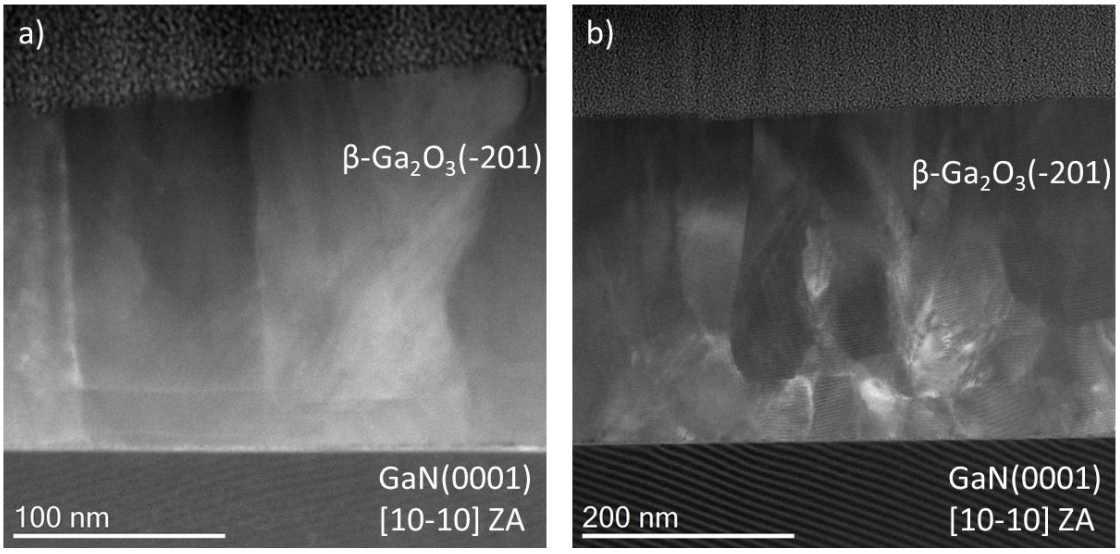

Figure S2: Medium angle annular dark field STEM micrographs showing grain size and strain contrast across the film thickness for a Ga_2O_3 growth without (a) and with (b) a low-temperature nucleation layer. Width of the Ga_2O_3 grains remained consistent throughout the film thickness when no nucleation layer was included in (a). Narrower grains were present near the interface when a nucleation layer was included in (b) although grain size was comparable between the two films near the top surface of the film.

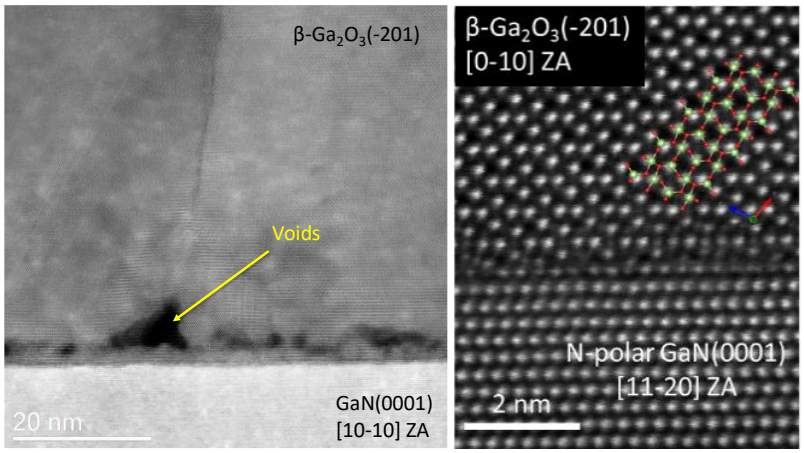

Figure S3: STEM of n-Ga_2O_3/N-polar p-GaN heterointerface with (left) and without (right) *ex situ* GaN oxidation. The *ex situ* oxidation resulted in a diffuse interface containing voids, while the *in situ* oxidation resulted in an atomically-abrupt interface.