Supplementary material

The formation of hexagonal patterns in HRSTEM images by stacking faults

A HRSTEM image of our zb-GaN NLs grown on 3C-SiC is shown in Figure S1 (a), in which only the heavier atoms, namely Si and Ga, are visible. The yellow dots in the figure indicate the basic pattern of these atoms in the zincblende structure viewed along the $[\bar{1}10]$ direction, which highlights the perfect stacking of the 3C-SiC substrate. The pattern in the region of the GaN NLs look very similar. However, frequently we observe "hexagonal" patterns in between the zb-pattern, as highlighted in the HRSTEM image. These hexagonal patterns in zb-GaN consists of the two basic zincblende sub-patterns, indicated by red and green dots, which are shifted by 1/3 [001] with respect to each other. They are caused by projection effects due to stacking faults as the schematics of the Ga-sites in the zb-structure in Figure S1 (b) and (c) illustrate. Figure S1 (b) shows an intrinsic SF of the $(\bar{1}11)$ plane as a discontinuity of the natural ABCABC stacking, when viewed along the $[\bar{1}\bar{1}0]$ zone axis. In this arrangement, the Ga atoms indicated by the green circles are at their natural positions, and the Ga atoms indicated by the red circles have been shifted by 1/6 $[1\bar{1}2]$ due to the discontinuity of the stacking sequence. When rotating this crystal together with the stacking fault by 90° around the [001] axis so that one views along $[\bar{1}10]$, one obtains a projection as shown schematically in Figure S1(c). This projection of the defect exhibits the same sub-lattices, shifted by 1/3 along [001] and forming together a hexagonal shaped pattern, as we observe sometimes in our HRSTEM images of the zb-GaN NLs. Therefore, it is reasonable to assume that these patterns in our experiments are caused by projection of {111} stacking faults in the zone normal to the viewing direction of the image and can be used as indication for stacking faults present in the early stage of growth.

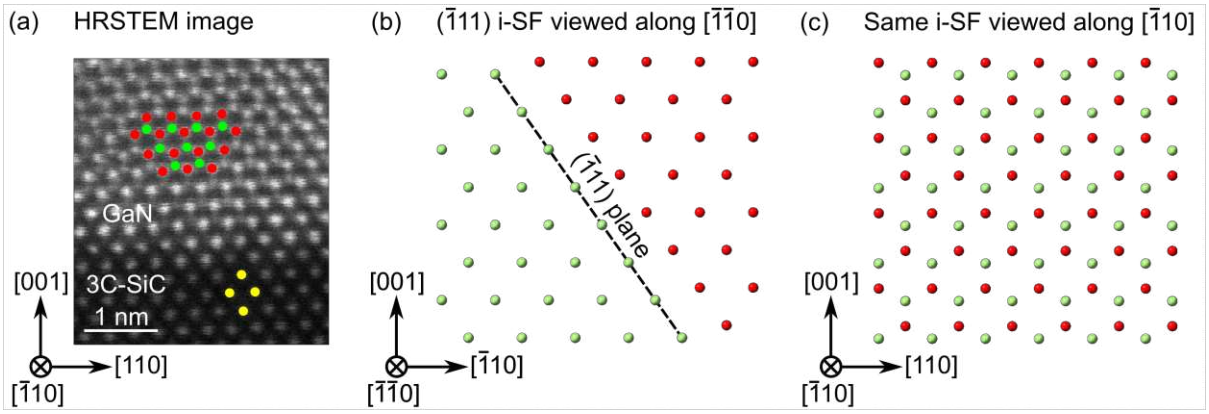

Figure S1: HRSTEM image of zb-GaN/3C-SiC near the interface highlighting the patterns of Si atoms (yellow) and hexagonal patterns of Ga atoms (green and red) (a). The schematics in (b) and (c) illustrate the formation of these patterns.