Cathodoluminescence study of stacking faults and dislocations in bulk GaN

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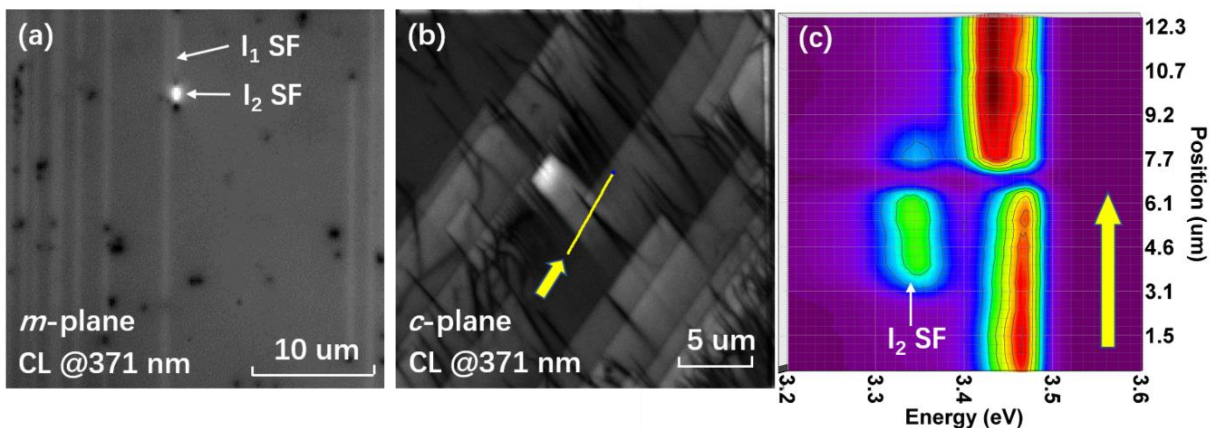
Wurtzite (WZ) GaN heterostructures exhibit strong polarization if they are fabricated on c-plane wafer. Thus, device fabrication on off-polar orientation, such as *a*-plane or *m*-plane, is preferable to avoid such problem. However, the off-polar wafers have another problem about structural defects. Namely, GaN bulk crystal may have a possibility to introduce stacking faults during crystal growth. In the physical point of view, stacking faults (SFs) yield the zinc-blend (ZB) layers in WZ crystal. Generally, the bandgap of ZB is lower than WZ, so that SFs act as natural quantum wells. In this study, we elucidated the SFs and dislocations in bulk GaN crystals grown along off-polar directions.



Cathodoluminescence (CL) study has performed at 77 K with an electron beam of 3 kV and 1 nA. Figures above show monochromatic CL images taken at 371 nm, which is characteristic peak of I_2 type SF. The *m*-plane specimen (a) shows bright lines, which correspond to SFs (edge on). The vicinal *c*-plane (b) shows the bright regions, which correspond to SFs (plane on). The configuration of dislocations on SF is clearly imaged. The line scan of CL spectra along yellow line in (b) is shown in (c). By analyzing these data with high resolution transmission electron microscopy (TEM) images, we are studying the mechanism of SF formation during growth.

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