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Inclined Dislocation Pairs in Green GaInN/GaN Light Emitting Diodes Grown on Bulk GaN Substrate¹ MINGWEI ZHU, THEERADETCH DETCHPROHM, SHI YOU, YONG XIA, WEI ZHAO, YUFENG LI, JAYANTHA SENAWIRATNE, CHRISTIAN WETZEL, Rensselaer Polytechnic Institute, LIANGHONG LIU, EDWARD PREBLE, DREW HANSER, Kyma Technologies, Inc. — Inclined dislocation pairs (IDPs) were observed for the first time in the active region of ten-quantum-well green GaInN/GaN light emitting diodes grown on c-plane bulk GaN substrate. The two inclined dislocations (IDs) in one IDP usually start closely in the first three quantum wells and propagate to different sides of [0001] growth direction. By analyzing transmission electron microscopy images of IDs at different projection directions and reconstructing them in the three dimensional crystal, all IDs were found to tilt from the [0001] direction towards the $\langle 1-100 \rangle$ directions by 18 - 23°. The two IDs in one IDP tilt to equivalent $\langle 1-100 \rangle$ directions separated by either 120° or 180°. All of the IDs are edge-type with a Burger vector $1/3\langle 11-20 \rangle$. The creation of IDPs might help to release the strain accumulated in the active region. In spite of the existence of these IDPs in the active region, this green LED on GaN shows a 7-fold stronger photoluminescence than those on sapphire.

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