Cathodoluminescence Classification of Threading Dislocations in Ga- and N-face GaN

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Recently, GaN has attracted much interest for power device application, due to its large band gap and high thermal stability. It is necessary to grow high quality GaN wafer because the crystal defects may suppress its performance and often cause the device failures. In order to improve the quality of GaN, the characterization of extended defects, especially threading dislocations, becomes much more important.

In this study, we have applied chemical etching technique and cathodoluminescence (CL) to distinguish dislocations in Ga-face and N-face GaN. Fig 1 (a) shows the etch pit patterns with slight difference according to the character of dislocations. For Ga-face GaN, no redshift was observed for etch pit of edge dislocation, as shown in fig 1 (c). Fig 1 (d) shows around 8 meV redshift of etch pit corresponding to mix dislocation. For N-face GaN, the largest redshift was observed for screw dislocations while no shift for edge dislocations. The detection of redshift in CL is one method to distinguish the dislocation character. The different redshift may be attributed to the deformation potential and the different types of dislocation may give the different roles on the power device performance.

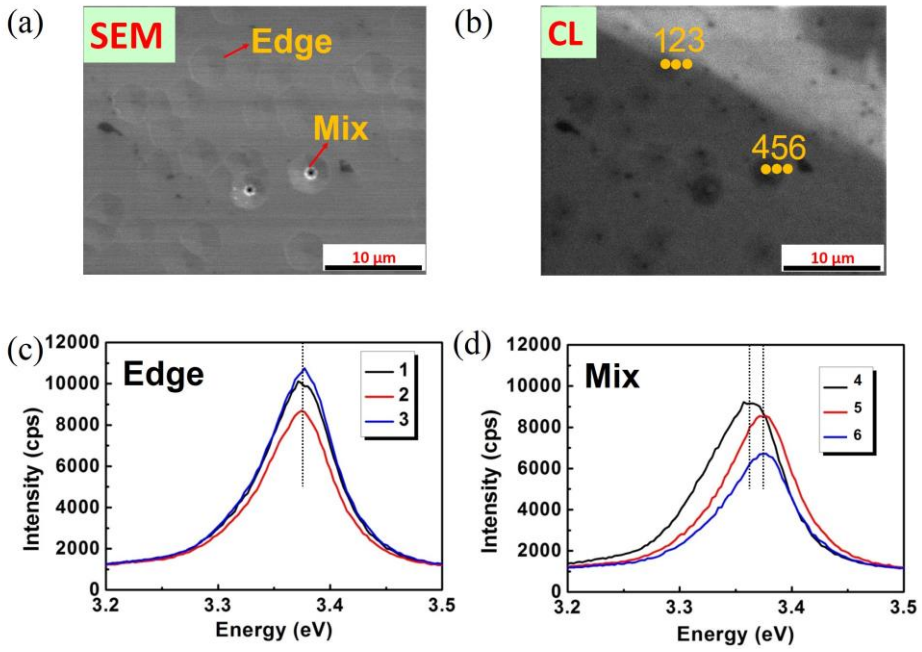

Fig. 1. (a) SEM and (b) CL image of Ga-face GaN after etched, CL emission of the positions near (c) edge and (d) mix dislocations.