第 50 回 GRL 浜松セミナー

2014 年 12 月 10 日 15:30～16:30 総合棟 204 室

Optical characteristics of nonpolar and semipolar nitride heterostructures

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Blue light emitting diodes (LEDs) based on nitride semiconductors won the Nobel Prize in Physics this year, and people believe the nitride semiconductors have the capability to save the world through energy conservation. This fact stands on very high internal efficiency of the blue LEDs. However, the potential of nitride semiconductors is not limited within the efficiency, of course. There are a lot of superior optical and electrical characteristics such as the broadband wavelength tunability from deep ultraviolet regime to near infrared regime, thermal stability of excitons, high electron mobility with high break down voltage, and so on.

In particular for optoelectronic devices, non-*c*-plane crystal planes, illustrated in Figure 1, are attractive to cancel out or reduce the quantum confined Stark effects (QCSEs). Nonpolar planes, such as *m*-plane, can completely cancel QCSEs out, moreover, large-scale *m*-plane GaN substrate are becoming available. On the other hand, crystal growth on semipolar planes such as $\{11\bar{2}2\}$, $\{20\bar{2}1\}$, and $\{30\bar{3}1\}$, is another approach. Such the planes can establish both the reduction of QCSEs and high indium incorporation in InGaN.

We will review optical characteristics of the nonpolar and semipolar nitride semiconductors, and pick some topics to discuss the details.

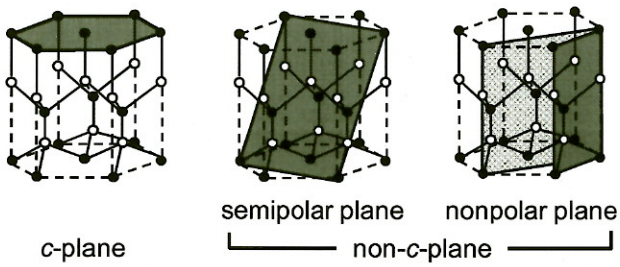

Fig. 1 Various crystal planes of Wurtzite structure.

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