

Growth and fabrication of nitride-based UV devices on various substrates

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Abstract: UV LED and/or LD using GaN/AlGa_N as an active layer was fabricated on various underlying layer. In case of sapphire substrate, combination of low temperature (LT-) interlayer and heteroepitaxial lateral overgrowth (HELO) or the facet controlled heteroepitaxial lateral overgrowth were found to be effective to obtain crack-free and low dislocation density AlGa_N. Performance of the UV LED is found to be strongly affected by the dislocation density if it is higher than $5 \times 10^7 \text{ cm}^{-2}$, which is thought to be one of the milestones for the fabrication of efficient UV LED. The shortest wavelength UV LD was also fabricated on the sapphire substrate using the combination of HELO and LT-interlayer. In case of ZrB₂ substrate which is lattice matched with Al_{0.26}Ga_{0.74}N, it is necessary to cover the surface by the low temperature deposited AlN or AlGa_N layer before the growth of AlGa_N at epitaxial temperature to prevent surface nitridation. High performance LED was fabricated on the ZrB₂ substrate. Details will be discussed.