

Improvement of optical properties of blue InGaN/GaN multiple quantum wells with Si delta-doped barrier

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Recently, we reported that the insertion of delta doping layer in the barrier of multiple quantum wells (MQWs) can improve the efficiency of InGaN/GaN UV LED⁽¹⁾. With the use of delta doping in the middle of barrier of MQWs, photoluminescence (PL) intensity of MQW and output power of UV LED was improved. In this work, we investigated the optical properties of InGaN/GaN blue MQWs with Si delta-doped barrier layer. Under an optimized condition, the room temperature PL intensity was improved by 3.6 times. It can be attributed to the increase in electron injection to QW layer by Si delta doping. In addition, it is resulted from the decrease in defect density which can cause the non-radiative recombination. From atomic force microscopy measurement, it clearly shows that the defect density of MQWs is significantly decreased with Si delta doping. The high resolution X-ray also shows that full width half maximum of -1st peak of MQW with Si delta doping is decreased, indicating in the improvement of crystal quality of MQW structure.

References

- [1] I. M. Kwon, et al., J. Appl. Phys. VOL. 97, 106109 (2005)