TTP-034

Optical properties of a-plane InGaN/GaN multi-quantum wells with green emission

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In the area of optoelectronic devices based on GaN and related ternary compounds, the two-dimensional system like as quantum wells (QWs) has been investigated as an effective structure for improving the light-emitting efficiency. Generally, the quantum well active regions in III-nitride light-emitting diodes grown on conventional c-plane sapphire substrates have critical problems given by the quantum confined Stark effect (QCSE) due to the effects of strong piezoelectric and spontaneous polarizations. However, the QWs grown on nonpolar templates are free from the QCSE since the polar-axis lies within the growth plane of the template. Also the unique characteristic of linear polarized light emission from nonpolar QW structures is attracting attentions because it is proper to the application of back-light units of liquid crystal display.

In this study, we characterized optical properties of the *a*-plane InGaN/GaN QW structures by temperature-dependent photoluminescence (TDPL) measurements. From the photoluminescence (PL) spectrum measured at 300 K, green emission centered at 520 nm was observed for the QW region. Since indium incorporation on nonpolar QWs is lower than that on c-plane, this high indium-doping on a-plane InGaN QWs is not common. Therefore, the effect of high indium composition on optical properties in a-plane InGaN QWs will be extensively studied.