Mg이 도핑된 GaN 에피층의 포토루미네센스 연구

The study of photoluminescence in Mg-doped GaN epilayers

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High quality magnesium doped GaN epitaxial layers on sapphire substrate were achieved by the rotating disk MOCVD. Energy levels of these acceptors were investigated by temperature dependent photoluminescence measurements. Magnesium concentration was varied from < 1 x 10^{19} to higher than 5 x 10^{19} cm^{-3}. In the samples with lower magnesium concentration we have observed free excitonic transitions and the donor-acceptor pair transition with its phonon replicas. For the samples with higher magnesium concentration the spectra were dominated by acceptor related transitions. In this study, we could not see any deep level luminescence even in highly Mg-doped GaN and free excitonic transitions were observed in doped materials. These facts show the high quality of samples.

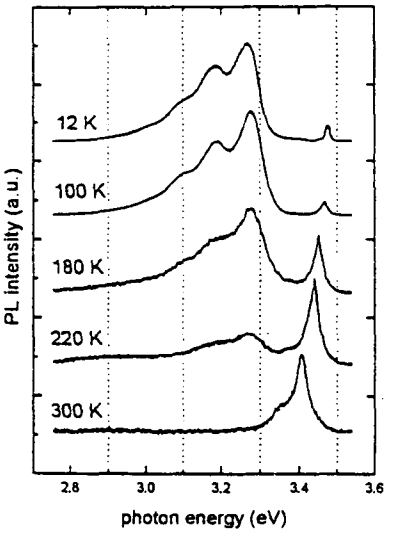

Fig. 1. Temperature dependent PL spectra for Mg-doped GaN epitaxial layers grown on (0001) sapphire substrate. Mg concentration is less than 1 x 10^{19} cm^{-3}.

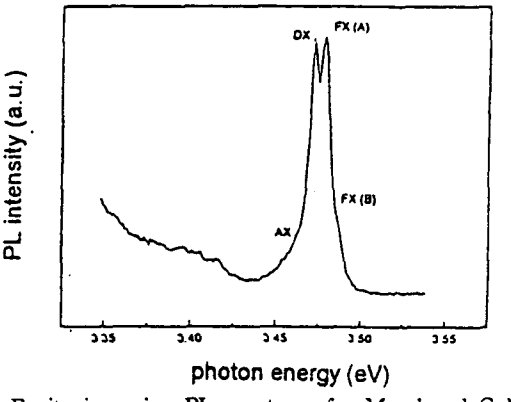

Fig. 2. Excitonic region PL spectrum for Mg-doped GaN at 12 K. Mg concentration is less than 1 x 10^{19} cm^{-3}.

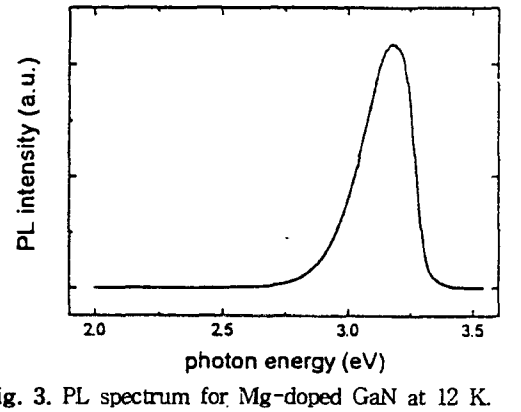

Fig. 3. PL spectrum for Mg-doped GaN at 12 K. Mg concentration is higher than 5 x 10^{19} cm^{-3}.