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Characteristic of Mg doping of a-plane and c-plane GaN

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The Mg-doped GaN films were grown by MOCVD on c-plane sapphire (0001) substrate. we as grown a 1㎛ thick Mg-doped GaN layer and then magnesium injected 550sccm. PL Intensity measurement used the Accent RPM 2000 using 266nm wavelength. The dopant in Mg-doped c-plane GaN forms acceptor level (~3.18 eV). We activatied Mg-doped c-plane GaN in nitrogen ambient by conventional furnace annealing (CFA). The CFA annealing temperature was between 550℃and 750℃. 650 °C activation exhibits better than the other activation temperature. The CFA annealing are at 650℃ and during between 10 to 20 minutes. We know 12 minutes exhibits better than the other activation minutes. The activated GaN forms acceptor level (~3.09 eV). We know that the band gap change 0.1 eV. A-plane GaN layers were grown on a r-plane sapphire substrate using also MOCVD system. We process the same procedure. The dopant in Mg-doped GaN forms accepter level (~3.05eV). The activated GaN forms acceptor level (~2.88 eV). We know that Mg doping of a-plane GaN is increasing than c-plane GaN.

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One-dimensional Kinematical X-ray Diffraction Model for InGaN/GaN Multi-quantum Well Structure

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We present one-dimensional kinematical x-ray diffraction model (1D KXRDM) to characterize the indium content and layer thickness of InGaN/GaN multiple quantum well (MQW) structure. In 1D KXRDM, some assumptions are applied. The first, InGaN layer and GaN layer are one-dimensional points and these points are arranged toward growth direction with an interval of d-spacing for each layer. The second, GaN layer is Ga atom(GA) as one-dimensional point and InGaN layer is the mixed atom (MA) that In atom and Ga atom are mixed up. The third, atomic size and electron number of MA are changed with linear relation according to indium content. Thus, using 1D KXRDM, atomic form factor of each layer of InGaN/GaN MQW is calculated as GA and MA and structure factor of that is calculated applying the number of GA and MA, which means the number of scattering plane for each layer thickness. Additionally, atomic form factor is multiplied by roughness term. Using synchrotron radiation with 10keV, GaN(0002) and GaN(0006) of the five period-InGaN/GaN MQW structure sample is measured. We find 1D KXRDM is well applied to InGaN/GaN MQW sample. Finally, the indium content and layer thickness of InGaN/GaN MQW structure can be determined reliably by one-dimensional kinematical x-ray diffraction model.