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Estimation of N atom density in a nitrogen radical source for GaN growth by optical emission spectroscopy–comparison with appearance mass spectrometry K. SASAKI, J. OSAKA, H. KANAI, T. ISHIJIMA, H. TOYODA, H. SUGAI, Nagoya University, Japan, N. SADEGHI, Université Joseph Fourier de Grenoble, France — We adopted optical emission spectroscopy (OES) for estimating N atom density in a nitrogen radical source, which was used for the growth of GaN film by molecular beam epitaxy. In addition, we compared the N atom density evaluated by OES with that evaluated by appearance mass spectrometry (AMS). We measured the intensities of optical emissions from N (747 nm) and N_2 (337 nm, the 2nd positive band) using a monochromator combined with an ICCD camera. The ratio of the N to N_2 densities ($[N]/[N_2]$) was obtained from the emission intensity ratio, by considering the rate coefficients for electron impact excitations. The absolute N atom density was estimated from the density ratio with the help of a thermodynamic equation of state $p = ([N] + [N_2])k_B T_g$, where the pressure p was measured using a capacitance manometer and the gas temperature T_g was evaluated from the rotational temperature of N_2 2nd positive band. We found an excellent agreement between the N atom densities evaluated by OES and AMS, when we assumed an electron temperature of 10 eV and an N_2 vibrational temperature of 5000 K. This work was supported by 21st Century COE (Center of Excellence) Program "'Information Nano-Devices Based on Advanced Plasma Science" of Nagoya University.

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