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Effect of Cryogenic Cooling for Gallium Nitride Film Placed in Argon Plasma DAISUKE OGAWA, YOSHITAKA NAKANO, KEIJI NAKAMURA, Chubu University — There is no doubt for a gallium nitride (GaN) film to have plasma-induced damage (PID) when exposed in a plasma discharge. Our technique to make in-situ monitoring on a GaN film exposed in argon plasma is valuable toward to reveal the evolution of the damage. We evaluated the PID with photoluminescence (PL) that is excited with a ultra-violet light source. Our preliminary result showed that the PL intensity at the blue luminescence band (BL: 400 – 480 nm) increased while the intensity at yellow luminescence (YL: 480 – 700 nm) decreased as the plasma exposure time increased. Chen et al. previously found that PL spectrum changes due to both PID and substrate temperature. However, BL intensity is independent from the substrate temperature, while BL intensity is dependent on the degree of PID. In this experiment, we performed the plasma exposure to a GaN film under the situation when the substrate temperature was cooled with liquid nitrogen. The substrate temperature is set at -110 degC and exposed plasma in 15 minutes. In this condition, our BL stayed almost constant. This is an indication that we might be able to avoid the damage in the wavelength shorter than 480 nm. We will show more details from this results and further progresses in this presentation.

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