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Epitaxial AlN thin film deposited on sapphire substrate by ECR plasma SATORU KANEKO, Kanagawa Industrial Technology Center, HIRONORI TORII, MES-AFTY, TAKASHI TOKUMASU, Tohoku University, SUNGKYUN PARK, Busan National University, MAMORU YOSHIMOTO, Tokyo Institute of Technology — We prepared aluminum nitride (AlN) thin film on c-plane sapphire substrate by electron cyclotron resonance plasma-enhanced sputtering deposition (ECR-sputtering). The target Al was placed within a argon plasma generated by the ECR plasma reactor. A lamp heater was used to increase the substrate temperature from room temperature to 500°C. The microwave (MW) power was set to be 700 W. The size of substrate holder was 4 inches in diameter. X-ray diffraction (XRD) verified the epitaxial growth of AlN films with the full width at half maximum (FWHM) of rocking curve of 0.04 deg. even on the film thickness of 100 nm. XRD also verified slight change of peak position from θ-2θ scan of AlN film along surface normal. By employed in-plane XRD, the epitaxial AlN films showed lattice constants different than the bulk AlN materials along both surface-normal and in-plane directions. The first principle theory was employed to evaluate stability of total energy with the varied lattice constants. The effect of varied lattice constants on band gap was estimated by using the GW approximation (GWA). To be compared with the theoretical results, the evaluation of band gap is experimentally in progress.

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