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Characterization of textitM-plane GaN thin film grown on pre-annealing β-$LiGaO_2$ (100) substrate[1] CHENG-DA TSAI, CHENG-HUNG SHIH, IKAI LO, YING-CHIEH WANG, CHEN-CHI YANG, YU-CHIAO LIN, Department of Physics, National Sun Yat-Sen University, Kaohsiung, Taiwan, R.O.C, MITCH M.C. CHOU, Department of Materials and Optoelectronic Science, National Sun Yat-Sen University, Kaohsiung, Taiwan, R.O.C — We used the plasma-assisted molecular-beam epitaxy to grow the M-plane GaN thin films on β-lithium gallate, β-$LiGaO_2$, which had been annealed in vacuum and in air ambient. With the X-ray diffraction analysis, different azimuth angles (0° and 90°) were applied in $\omega-2\theta$ scanning measurement. The signal of M-plane GaN was deviated from the normal value to be -0.147 in vacuum and -0.048 in air ambient, which showed that LGO substrate pre-annealed in air can reduce the compressive strains in the growing sample effectively. The same result was confirmed by the Raman scattering analysis. It showed that the sample pre-annealed in vacuum had E_2 phonon frequency which was shifted to 574.35 cm^{-1} due to the stress and the sample pre-annealed in air had E_2 phonon frequency which was shifted only to 568.73 cm^{-1}. In conclusion, thermal annealing of β-$LiGaO_2$ substrate in air can improve the quality of growing M-plane GaN and effectively suppresses the formation of lithium-rich surface for the growth M-plane GaN thin films on β-$LiGaO_2$ substrate.

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