High Electron Mobility $\text{Al}_x\text{Ga}_{1-x}\text{N}/\text{GaN}$ Heterostructures Grown by PAMBE on GaN Templates Prepared by MOCVD$^1$ YEN-LIANG CHEN, WEN-YUAN PANG, MING-HONG GAU, YU-CHI HSU, WANG-TSANG WANG, JIH-CHEN CHIANG, IKAI LO, Department of Physics, National Sun Yat-Sen University, Kaohsiung, Taiwan, R.O.C., CHIA-HO HSIEH, Institute of Material Science and Engineering, National Sun Yat-Sen University, Kaohsiung, Taiwan., JENN-KAI TSAI, Department of Electronic Engineering, National Formosa University, Yunlin, Taiwan, ROC. — A series high mobility $\text{Al}_x\text{Ga}_{1-x}\text{N}/\text{GaN}$ heterostructures samples were grown on MOCVD-grown GaN templates by molecular beam epitaxy with different Al fractions ($x = 0.017$ to $0.355$). The highest mobility in this series samples at liquid nitrogen temperature is $14110$ cm$^2$/Vs with carrier concentration $2.87 \times 10^{12}$ cm$^{-2}$ and Al fraction $x = 0.022$. In our experiments, the carrier density decreases as Al content reduces. While the carrier density decreases from $1.54 \times 10^{13}$ cm$^{-2}$ to $2.87 \times 10^{12}$ cm$^{-2}$, the mobility increases. But as the carrier density decreases from $2.87 \times 10^{12}$ cm$^{-2}$, the mobility decreases.

$^1$The project is supported by National Research Council of Taiwan (NRC 95-2112-M-110-017-MY3) and by AFOSR/AOARD (AFMC, USAF) under grant number FA4869-07-1-4022.