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Growths of Lattice-Matched AlInN Alloys on GaN GUANGYU LIU, HONGPING ZHAO, JING ZHANG, G. S. HUANG, NELSON TANSU, Lehigh University — III-Nitride alloys have tremendous importance for solid state lighting, power electronics, visible lasers, and thermoelectric applications. Lattice-matched AlInN material has the potential to realize large bandgap material for achieving optimized heterostucture design for nitride-based devices. In this work, the growths of AlInN alloys with different In-contents were performed. The growths were performed by employing metalorganic chemical vapor deposition. The AlInN alloys were grown on 2.7 μm undoped GaN template grown on sapphires. The growth temperatures were investigated from 750 °C up to 860 °C. From our experiments, the In-content from 0.367% up to 22.8% were obtained from AlInN alloy as the growth temperature were reduced from 860 °C down to 750 °C. The crystal quality and In-content of the AlInN film were characterized by high-resolution X-ray diffraction measurements. Scanning electron microscopy measurements and atomic force microscopy were carried out to characterize the surface morphology of the film. The optimized growth condition for the lattice-matched AlInN film was achieved by employing growth temperature of 780 °C at growth pressure of 20 Torr, with growth rate of 0.15 μm/hr.

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