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Growth of $Al_xGa_{1-x}N$ Structures on 8 in. Si(111) Substrates

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Device-oriented GaN layers have been grown with $Al_xGa_{1-x}N$ buffer structures as a bottom layer on 8 in. Si substrates using a commercial high-throughput metal organic chemical vapor deposition (MOCVD) system. The effect of the V/III ratio on the growth of AlN nucleation layers formed directly on Si(111) substrates has been analyzed. The effects of parasitic reactions between the group III precursor and ammonia have been observed to be a major stumbling block in achieving a high growth rate with better crystalline quality of AlN layers on Si(111) substrates. In addition, the effect of the growth rate of strain-relieving $Al_xGa_{1-x}N$ buffer structures on the wafer curvature of GaN structures during growth has been studied. It was found that the rapid growth of $Al_xGa_{1-x}N$ buffer structures helps reduce wafer bowing in GaN grown on top of the buffer structures.

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