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Effects of Dopants and Annealing on the Structure and Electronic properties of GaAsN[1] YU JIN, MATTHEW REASON, HAILING CHEN, CAGLIYAN KURDAK, RACHEL GOLDMAN, University of Michigan — In this work, we investigate the effects of different n-type dopants and rapid thermal annealing (RTA) on the structure and electronic properties of GaAsN bulk-like films grown by molecular beam epitaxy. For as-grown GaAsN:Si and GaAsN:Te films, similar free carrier densities (n) and electron mobilities (μ) are observed. However, after post-growth RTA, a substantial increase in both n and μ is observed in the GaAsN:Te films, with negligible change in those of the GaAsN:Si films. Apparently, RTA reduces the concentration of N-related trapping and scattering centers in GaAsN:Te. On the other hand, the annealing process enhances the diffusion of Si, presumably leading to the formation of additional N_{As}-Si_{Ga}defect complexes. For both GaAsN:Te and GaAsN:Si films, x-ray rocking curves reveal reduced lattice parameters following annealing, suggesting a decrease in the interstitial [N], which leads to the improvement in electronic properties for the GaAsN:Te films. In the case of GaAsN:Si, the reduction in interstitial [N] is presumably balanced by an increase in the density of N_{As}–Si_{Ga} defect complexes. The effect of dopants and annealing on the structure and electronic properties of InGaAsN will also be discussed.

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