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**Effects of Si-N complexes on the electronic properties of GaAsN**[1]

YU JIN, RYAN JOCK, HAILING CHENG, CAGLIYAN KURDAK, University of Michigan, RACHEL GOLDMAN, University of Michgan — Silicon is the most common n-type dopant in GaAs-based materials and devices; however, in dilute nitride alloys, it has been suggested that Si and N atoms form Si-N complexes which act as deep electron traps. Here, we report the first quantitiative evidence of Si-N complex formation by comparing the properties of GaAsN films doped with Si and Te, with a variety of N-dopant spatial separations. First, we compare bulk-like GaAsN:Si films, where Si and N reside in the same layer, with modulation doped heterostructures, where N and Si atoms are spatially separated. A decrease in free carrier concentration, [n], with increasing N composition is observed in bulk-like films but not heterostructures, suggesting N-Si defect complexes in the bulk GaAsN layers are likely acting as trapping centers. In addition, we compared GaAsN films doped with Si and Te. For GaAsN:Te films, [n] increases substantially with increasing annealing temperature, but little change is observed in GaAsN:Si films. In GaAsN:Si, the annealing-induced increase in [n] is balanced by the formation of additional Si-N complexes.

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Yu Jin
University of Michigan

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