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Growth, incorporation and properties of GaAsBi grown by molecular-beam epitaxy

Abstract: In this talk we will describe recent efforts at NREL to understand the incorporation of Bi into GaAs grown by molecular-beam epitaxy. GaAsBi growth requires low substrate temperatures and very low V/III ratios in order to keep the Bi from segregating to the growing surface. Unfortunately, these conditions are the opposite of what is typically used for the growth of high-quality III-V's. Here, we attempt to increase the useable window of growth parameter space. Trends in Bi incorporation as a function of substrate temperature, V/III ratio, growth rate and doping will be presented. Additionally, we will discuss the electronic quality of GaAsBi layers doped both n-type (with Si) and p-type (with C and Be). We find no significant degradation of the n-type layers with increasing Bi content, as expected, but we do see compensation of acceptors and lowered mobilities in p-type material. We attribute these effects to the incorporation of Bi pairs and clusters.