Abstract Submitted
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Amphoteric Doping of GaAsBi alloys with Silicon R.L. FIELD III, T. JEN, B. YARLAGADDA, M. LUENGO-KOVAC, V. SIH, C. KURDAK, R.S. GOLDMAN, University of Michigan, Ann Arbor, MI 48109 — Due to the significant bandgap reduction associated with bismuth incorporation, dilute bismuthide semiconductor alloys have been proposed for high-efficiency optoelectronic devices. Although Si and Be are the most common dopants for n- and p-type doping of GaAs and related materials during MBE growth, their use in high quality structures has limitations. For example, while Be has a high active solubility in GaAs, it is also a fast diffuser in GaAs. In this work, Si is found to be an amphoteric dopant in GaAsBi by varying the As_4/Ga beam equivalent pressure ratio, resulting in n-type (p-type) films due to Si entering group III (group V) sites. The hole mobility is found to decrease with Bi composition, an indication that Bi-related defects are the main source of scattering in p-type GaAsBi. Yet, the electron mobility appears independent of Bi composition, at least in the range of compositions that have been fabricated and measured. To date, we have achieved Bi incorporation in excess of 6% Bi substituting for As, with electron mobilities as high as 2500 cm^2/V-s for Si-doped ($n \approx 10^{18}$ cm^{-3}) GaAsBi. Using Si provides an alternative to the traditional use of C and Be as p-type dopants.

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