

Study of the relationship of AlInGaAs solid composition to MOVPE gas phase precursor ratios

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In the fabrication of compound semiconductor devices, control of the solid-state alloy composition is required for the “bandgap engineering”. The AlInGaAs alloy is applied in commercial laser manufacturing today and the relationship between the alloy composition and the band gap is well-documented.[1] Typically, the relationship between the solid state composition and the gas-phase precursors in MOVPE is inferred from the measured lattice constant and band gap energy.[2] However, it has been shown that the alloy composition of an epitaxial layer can be accurately determined through elemental analysis after its dissolution, and this information can be used to improve band gap models. [3], [4]

We use ICP-OES elemental analysis, in-situ precursor flow measurements, in-situ reflectometry, and ex-situ PL and XRD measurements to compare the ratio of gas-phase to solid-phase compositions for two MOVPE reactors. Additionally, we verify band gap models using measured solid-state compositions.

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