High-quality MOVPE butt-joint integration of InP/AlGaInAs/InGaAsP-based all-active optical components

In this paper, we demonstrate the applicability of MOVPE butt-joint regrowth for integration of all-active InP/AlGaAs/InGaAsP optical components and the realization of high-functionality compact photonic devices. Planar high-quality integration of semiconductor optical amplifiers of various epi-structures with a multi-quantum well electro-absorption modulator has been successfully performed and their optical and crystalline quality was experimentally investigated. The regrown multi-quantum well material exhibits a slight bandgap blue-shift of less than 20 meV, when moving away from the regrowth interface. In closest vicinity to the mask, the growth profile revealed a bent-up shape which is associated with an increase in the bandgap energy resulting from the combined effect of growth rate suppression and higher Ga concentration. This increase in bandgap energy makes the interface partially transparent (thus beneficial for unaffected light transmission) and forces carriers away from possible interfacial defects. The internal reflectivity below 2.1×10-5 ensures minimization of detrimental intracavity feedback.

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