InP/InGaAlAs Distributed Bragg Reflectors Grown by Low Pressure Metal Organic Vapor Deposition

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Long wavelength vertical cavity surface emitting lasers (VCSELs) are considered to be the best candidate for the future low cost reliable light sources in fiber communications. However, the absence of high refractive index contrast in InP-lattice-matched materials impeded the development of 1.3-1.5μm VCSELs. Although wafer fusions provided the alternative approaches to integrate the InP based gain materials with the GaAs/AlAs materials for their inherent high refractive index contrast, the monolithic InP-based latticed-matched distributed Bragg reflectors (DBRs) are still highly attractive and desirable.

In this report, we demonstrate novel InP/InGaAlAs DBRs with larger refractive index contrast than InP/InGaAsP and InAlAs/InGaAlAs DBRs. The switching between InP and InGaAlAs layers and growth rate control have been done by careful growth interruption technique and accurate in situ optical monitoring in low pressure metal organic chemical vapor deposition. A 35 pairs 1.55μm centered InP/InGaAlAs DBRs has the stopband of 95nm and the highest reflectivity of more than 99%. It should be applicable for the fabrication of the 1.3-1.5μm VCSELs devices.