

HIGHLY RELIABLE InGaAsP/InP LASERS WITH DEFECT-FREE REGROWTH INTERFACES FORMED BY NEWLY COMPOSED HBr-BASED SOLUTIONS

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Abstract

The reliability of buried heterostructure laser diodes (BHLDs) that have a dry-etched mesa structure has been improved by about ten times by using optimized HBr-based wet chemical etchants. This improved reliability was achieved by reducing the amount of defects at the regrowth interfaces by using a newly optimized HBr-Br₂-H₂O solution with a composition range from 0.30 M HBr/0.022 M Br₂ to 0.50 M HBr/0.020 M Br₂. Solutions in this range produce the same etching rates of the (110) InP cladding layers and the (110) InGaAsP multi-quantum-well active layer. The etching mechanism of the InGaAsP/InP material system in the HBr-Br₂-H₂O solutions was found to be an oxide-dissolution reaction.