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High Temperature Characteristics of Strained InGaAs/InGaAsP Quantum Well Lasers Lattice Matched to GaAs

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The effect of high temperature on the threshold current density and the gain of InGaAs/InGaAsP ($E_g = 1.6$ eV) QW lasers lattice matched to GaAs is investigated theoretically. These results are also compared with those of InGaAs/GaAs QW lasers. It is found that better performance can be achieved in InGaAs/InGaAsP lasers compared to InGaAs/GaAs lasers at high temperature. This is due to the fact that the temperature dependence of the threshold carrier density for InGaAs/InGaAsP lasers is weaker than that for InGaAs/GaAs lasers. The calculated characteristic temperature is in good agreement with reported experimental results.