RESEARCH ARTICLE | MAY 01 2019

Electroluminescence enhancement in mid-infrared InAsSb resonant cavity light emitting diodes for CO_2 detection

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Appl. Phys. Lett. 114, 171103 (2019)

https://doi.org/10.1063/1.5090840 Article history

In this work, we demonstrated a mid-infrared resonant cavity light emitting diode (RCLED) operating near $4.2\,\mu$m at room temperature, grown lattice-matched on a GaSb substrate by molecular beam epitaxy, suitable for CO_2 gas detection. The device consists of a 1λ-thick microcavity containing an $InAs_{0.90}Sb_{0.1}$ active region sandwiched between two high contrast, lattice–matched $AlAs_{0.08}Sb_{0.92}$/GaSb distributed Bragg reflector (DBR) mirrors. The electroluminescence emission spectra of the RCLED were recorded over the temperature range from 20 to 300 K and compared with a reference LED without DBR mirrors. The RCLED exhibits a strong emission enhancement due to resonant cavity effects. At room temperature, the peak emission and the integrated peak emission were found to be increased by a factor of ~ 70 and ~ 11, respectively, while the total integrated emission enhancement was $\sim \times 33$. This is the highest resonant cavity enhancement ever reported