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Abstract:We investigate the temperature performance of terahertz quantum cascade lasers with different radiative recombination strength, using Monte Carlo simulation which includes electron-phonon and electron-electron scattering. The radiative and nonradiative transitions are simultaneously enhanced with the increase of optical transition matrix element. The influences on the optical mode gain are revealed by the evolution of laser levels' lifetime, population inversion, and parasitic carrier transport paths. The calculation results indicate that the temperature performance can be further improved with an increased radiative transition matrix element around 4.0 nm. The lasing temperature above 200 K is predicted. (C) 2012 American Institute of Physics. [http://dx.doi.org/10.1063/1.4729531]
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