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Title:Mid-infrared quantum cascade lasers

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Abstract:Mid-infrared quantum cascade lasers are semiconductor injection lasers whose active core implements a multiple-quantum-well structure. Relying on a designed staircase of intersubband transitions allows free choice of emission wavelength and, in contrast with diode lasers, a low transparency point that is similar to a classical, atomic four-level laser system. In recent years, this design flexibility has expanded the achievable wavelength range of quantum cascade lasers to similar to 3-25  $\mu\text{m}$  and the terahertz regime, and provided exemplary improvements in overall performance. Quantum cascade lasers are rapidly becoming practical mid-infrared sources for a variety of applications such as trace-chemical sensing, health monitoring and infrared countermeasures. In this Review we focus on the two major areas of recent improvement: power and power efficiency, and spectral performance.

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