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Title:Photonic engineering of surface-emitting terahertz quantum cascade lasers

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Abstract: Various resonators for surface emission are reviewed that have recently been developed to improve radiative- and collection-efficiencies of terahertz quantum cascade lasers (THz QCL). While the fabrication of waveguides for long wavelengths is challenging in terms of molecular beam epitaxy, long wavelengths also provide a wonderful testbed for new photonics structure concepts, since these can be easily produced by conventional optical lithography because of the typically large size of the required features. This led to novel geometries, like one- and two-dimensional non-periodic photonic crystals, or circular gratings for microdisk- and ring-lasers, which are all implemented by simply patterning the top metal cladding of a metal-metal waveguide. The modeling of such resonators with the finite element method is also described, highlighting the importance of this tool for the engineering of surface losses and far-field patterns. Number of references:49