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Accession number:20115214639697
Title:Beam engineering of quantum cascade lasers
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Source title:Laser and Photonics Reviews
Abbreviated source title:Laser Photon. Rev.
Volume:6
Issue:1
Issue date:January 2012
Publication year:2012
Pages:24-46
Language:English
ISSN:18638880
E-ISSN:18638899
Document type:Journal article (JA)
Publisher:Wiley-VCH Verlag, P.O. Box 101161, Weinheim, D-69451, Germany
Abstract:This paper reviews beam engineering of mid-infrared and terahertz quantum cascade lasers (QCLs), based on two approaches: designer plasmonic structures and deformed microcavities. The plasmonic structures couple laser emission into surface waves and control the laser wavefront in the near-field, thereby greatly increasing beam collimation or introducing new functionalities to QCLs. The plasmonic designs overall preserve laser performance in terms of operating temperature and power output. The deformed microcavity QCLs operate primarily on whispering-gallery modes, which have much higher quality factors than other modes, leading to lower threshold current densities. Cavity deformations are carefully controlled to greatly enhance directionality and output power.
Number of references:137