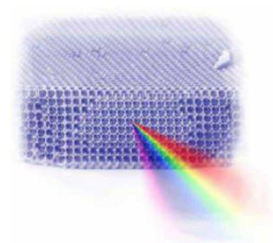


University of Belgrade
Institute of Physics Belgrade
Kopaonik, March 10-14, 2024



Book of Abstracts

17th Photonics Workshop

(Conference)



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Kopaonik, Serbia, March 10-14, 2024

Publisher, 2024:

Institute of Physics Belgrade

Pregrevica 118

11080 Belgrade, Serbia

Editors:

Dragan Lukić, Marina Lekić, Zoran Grujić

ISBN 978-86-82441-62-5

Printed by:

NEW IMAGE d.o.o.

Tošin Bunar 185, Belgrade

Number of copies: 60

CIP - Каталогизација у публикацији
Народна библиотека Србије, Београд

535(048)
681.7(048)
66.017/.018(048)

PHOTONICS Workshop (17 ; 2024 ; Kopaonik)

Book of Abstracts / 17th Photonics Workshop, (Conference), Kopaonik, March 10-14, 2024 ;
[organized by Institute of Physics Belgrade, Photonics center [and] Optical Society of Serbia] ;
[editors Dragan Lukić, Marina Lekić, Zoran Grujić]. - Belgrade : Institute of Physics, 2024
(Belgrade : New image). - 75 str. : ilustr. ; 25 cm

Tiraž 60. - Registar.

ISBN 978-86-82441-62-5

Optical and transport properties of THz quantum cascade heterostructures

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Abstract. We present our recent work on modeling quantum cascade laser [1] (QCL) gain media tailored for emission at THz frequencies where we have considered the effects associated with MBE growth that may have a prominent impact on THz QCL transport. GaAs/AlGaAs THz QCL structures were numerically simulated using density matrix formalism [2]. Appropriate lifetimes and dipole moments were calculated using a self-consistent Schrodinger-Poisson algorithm and comprehensive models of scattering rates including interface roughness, ionized impurity, alloy disorder, electron-electron, and electron-phonon scattering. We have considered and evaluated theoretically the most common designs as well as a novel THz QCL design promising for nearly room temperature operation [3]. Furthermore, novel wide bandgap oxide material platforms such as nonpolar m-plane ZnO quantum well structures were numerically investigated since they are predicted to be promising candidates for optoelectronic devices in the THz range owing to large ZnO LO phonon energy which reduces the thermally activated LO-phonon scattering, a possibility to greatly improve the temperature performance of THz QCLs [4,5].

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Acknowledgments

This work was financially supported by the Ministry of Science, Technological Development and Innovation of the Republic of Serbia under contract number: 451-03-47/2023-01/200103, "Multi-Scale Modeling of Terahertz Quantum Cascade Laser Active Regions", Multilateral scientific and technological cooperation in the Danube region 2020-2021, "DEMETRA: Development of high-performance mid-IR / THz quantum cascade lasers for advanced applications", Science Fund of the Republic of Serbia, Serbian Science and Diaspora Collaboration Programme: Knowledge Exchange Vouchers, COST Action CA21159 PhoBioS, Vlatacom Institute of High Technologies under project 178, and Science Fund of the Republic of Serbia, 10504, "Ultra-short pulsations from TERAhertz quantum cascade laser using passive mode-LOCKing with graphene saturable absorber" - TERALOCK.