Sven Höfling et al., J Phys Chem Biophys 2015, 5:4
http://dx.doi.org/10.4172/2161-0398.C1.013

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3rd International Conference and Exhibition on
Lasers, Optics & Photonics
September 01-03, 2015 Valencia, Spain

Single mode interband cascade lasers

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Twenty years after their first reference interband cascade lasers (ICLs) have become a mature and competitive semiconductor laser source in the mid-infrared region. The carrier rebalancing concept that was introduced in 2011 drastically improved the performance. As a consequence the wavelength window that is accessible for ICLs operating at ambient temperatures could be extended. For GaSb based ICLs cw-emission at room temperature could be achieved up to a wavelength of 5.6 µm. As the need for thicker claddings at longer wavelengths makes the growth of the super lattice claddings increasingly difficult and limits the heat dissipation, a plasmon waveguide structure with highly doped InAs-layers grown on InAs-substrates is typically used for ICLs emitting beyond 6 µm. At cryogenic temperatures plasmon waveguide based ICLs have shown emission up to 10.4 µm. Up to now there has not been an attempt to explore the lower wavelength limit of ICLs. Here we present cw emission of a GaSb based ICL emitting at 2.8 µm and room temperature pulsed operation of an InAs based plasmonic waveguide ICL up to 7.1 µm. Furthermore, we show single mode emitting ICLs with distributed feedback gratings emitting between 2.8 and 5.2 µm.

Biography

Sven Höfling received his diploma degree from the University of Applied Physics and his PhD degree from Würzburg University. During his scientific carrier he has more over been affiliated with the Fraunhofer Institute of Applied Solid State Physics, Stanford University, the University of Tokyo and the National Institute of Informatics in Tokyo. He is holding personal chairs in physics at the University of Wuerzburg, Germany, and at the University of St. Andrews, Scotland and he is running the 550 m^2 clean room facility Gottfried-Landwehr-Laboratory for Nanotechnologies. He published about 250 papers in peer reviewed scientific journals and he delivered more than 50 invited talks at international conferences.

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