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TRANSLATIONAL RESEARCH

3D FABRICATION

A low effective mass material system for quantum cascade detectors *(Invited Paper)*

Paper 9755-37

Time: 9:30 AM - 9:50 AM

Author(s): Peter Reininger, Tobias Zederbauer, Benedikt Schwarz, Hermann Detz, Donald MacFarland, Aaron M. Andrews, Werner Schrenk, Gottfried Strasser, Technische Univ. Wien (Austria)

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We introduce InAs/AlAsSb as material system for quantum cascade detectors. The greatest benefit is the low effective mass of the well material that improves the total absorption of the detector and decreases the intersubband scattering rates, which increases the device resistance and thus enhances the noise behaviour. We have designed, grown, and measured a QCD that detects at a wavelength of $\lambda=4.84\mu\text{m}$ and shows a peak specific detectivity of approximately 2.7×10^7 Jones at $T=300\text{K}$ and 2.87×10^{10} Jones at 80K .

CONFERENCE 9755

TUESDAY 16 FEBRUARY

SESSION 9 TUE 8:00 AM TO 8:30 AM

Keynote Session III

Session Chair: Manijeh Razeghi, Northwestern Univ. (USA)

Imperceptible active sensors for cyber-physical systems (Keynote Presentation), Tsuyoshi Sekitani, Osaka Univ. (Japan) [9755-33]

SESSION 10 TUE 8:30 AM TO 10:10 AM

Infrared Detection I

Session Chairs: Philippe Christol, Institut d'Electronique du Sud (France); Michel Krakowski, III-V Lab. (France)

Radiation tolerance studies of long wavelength infrared InAs/GaSb detectors (Invited Paper), Alexander Solbel, Sir Rafol, Arezou Khoshakhlagh, Jean Nguyen, Linda Höglund, Anita Fisher, Sam Keo, David Ting, Sarah Gunapala, Jet Propulsion Lab. (USA) [9755-34]

Mid-infrared interband cascade photodetectors with high quantum efficiency (Invited Paper), Zhao-Bing Tian, The Univ. of New Mexico (USA); Anjali Singh, Kevin Rigg, Northrop Grumman Electronic Systems (USA); Sanjay Krishna, The Univ. of New Mexico (USA) [9755-35]

Recent progress in interband cascade IR photodetectors (Invited Paper), Rui Q. Yang, The Univ. of Oklahoma (USA) [9755-36]

A low effective mass material system for quantum cascade detectors (Invited Paper), Peter Reininger, Tobias Zederbauer, Benedikt Schwarz, Hermann Detz, Donald MacFarland, Aaron M. Andrews, Werner Schrenk, Gottfried Strasser, Technische Univ. Wien (Austria) [9755-37]

Radiometric and radiation tolerance characterization of IR photodiodes employing unipolar barrier detector architectures with bulk and T₂SLS III-V absorbers (Invited Paper), Vincent M. Cowan, Christian P. Morath, Eli Garduno, Geoffrey D. Jenkins, John E. Hubbs, Air Force Research Lab. (USA) .. [9755-38]

SESSION 11 TUE 10:40 AM TO 12:00 PM

Infrared Detection II

Session Chairs: Gail J. Brown, Air Force Research Lab. (USA); Jan Misiewicz, Wroclaw Univ. of Technology (Poland)

Metamorphic InAsSb_x/InAsSb_y heterostructures: new materials for infrared photonics (Invited Paper), Gregory Belenky, Youxi Lin, Leon Shterengas, Dmitry V. Donetsky, Gela Kipshidze, Sergey Suchalkin, Stony Brook Univ. (USA); Wendy L. Samey, Stefan P. Svensson, U.S. Army Research Lab. (USA) [9755-39]

Surface plasmonic resonance enhanced type II strain-layer superlattice photodetector (Invited Paper), Guiru Gu, Stonehill College (USA); Jarrod N. Vaillancourt, Applied NanoFemto Technologies LLC (USA); Xuejun Lu, Univ. of Massachusetts Lowell (USA) [9755-40]

Photoluminescence studies of InAs/InAsSb type-II infrared superlattices (Invited Paper), Elizabeth H. Steenbergen, Air Force Research Lab. (USA); Jeremy A. Massengale, The Univ. of Oklahoma (USA); Yong-Hang Zhang, Arizona State Univ. (USA) [9755-41]

InAs-based type-II superlattice long wavelength infrared photodetectors (Invited Paper), Jianxin Chen, Fangfang Wang, Zhicheng Xu, Yi Zhou, Li He, Shanghai Institute of Technical Physics (China) [9755-42]

Lunch/Exhibition Break Tue 12:00 pm to 1:30 pm

SESSION 12 TUE 1:30 PM TO 3:30 PM

Nanophotonics and Plasmonics I

Session Chairs: John M. Zavada, Polytechnic Institute of New York Univ. (USA); Jean-Pierre Huignard, Jphopto (France)

Metamaterial-based nanobiosensors and nanophotodetectors (Invited Paper), Ekmel Ozbay, Bilkent Univ. (Turkey) [9755-43]

Optimization of plasmonic grating resonators based on highly-doped semiconductors for sensing applications using 2D finite-difference time-domain simulations (Invited Paper), Franziska B. Barho, Maria Jose Milla Rodrigo, Fernando Gonzalez-Posada Florès, Thierry Tallercio, Univ. Montpellier 2 (France) [9755-44]

Tuning of the localized surface plasmon wavelength in highly-doped

InAsSb/GaSb nanostructures (Invited Paper), Maria José Milla Rodrigo, Franziska B. Barho, Institut d'Electronique du Sud (France); Fernando Gonzalez-Posada Florès, Commissariat à l'Énergie Atomique (France); Laurent Gerutti, Univ. Montpellier 2 (France); Jean-Baptiste Rodriguez, Eric Toumieu, Thierry Tallercio, Institut d'Electronique du Sud (France) [9755-45]

Spontaneous mirror-symmetry breaking in two coupled nanolasers (Invited Paper), Philippe Hamel, Fabrice Raineri, Paul Monnier, Isabelle Sagnes, Juan Ariel Lavenson, Alejandro M. Glacottoli, Lab. de Photonique et de Nanostructures (France) [9755-46]

Theoretical and experimental investigation of optically spin-injected VECSEL (Invited Paper), Ghaya Balli, Alexandre Joly, Thales Research & Technology (France); Julien Frougier, Unité Mixte de Physique CNRS/Thales (France); Mehdi Alouini, Institut de Physique de Rennes (France); Jean-Marie George, Unité Mixte de Physique CNRS/Thales (France); Isabelle Sagnes, Lab. de Photonique et de Nanostructures (France); Daniel Dolfi, Thales Research & Technology (France) [9755-47]

Dynamic control of chaotic resonators (Invited Paper), Andrea Di Falco, Univ. of St. Andrews (United Kingdom); Roman Bruck, Univ. of Southampton (United Kingdom); Changxu Liu, King Abdullah Univ. of Science and Technology (Saudi Arabia); Otto L. Muskens, Univ. of Southampton (United Kingdom); Andrea Fratallocchi, King Abdullah Univ. of Science and Technology (Saudi Arabia) [9755-48]

SESSION 13 TUE 4:00 PM TO 6:00 PM

Nanophotonics and Plasmonics II

Session Chairs: Ekmel Ozbay, Bilkent Univ. (Turkey); Dimitris Pavlidis, Boston Univ. (USA)

Quantum photonics with color centers in diamond and nanophotonic structures (Invited Paper), Simeon Bogdanov, Mikhail Y. Shalaginov, Jing Liu, Purdue Univ. (USA); Vadim V. Vorobyov, Photonic Nano-Meta Technologies (Russian Federation); Polina V. Kapitanova, ITMO Univ. (Russian Federation); Marcello Ferrara, Heriot-Watt Univ. (United Kingdom); Alexei Lagutchev, Purdue Univ. (USA); Alexey V. Akimov, Russian Quantum Ctr. (Russian Federation); Pavel A. Belov, ITMO Univ. (Russian Federation); Alexander V. Kildishev, Joseph M. Irudayaraj, Alexandra Boltasseva, Vladimir M. Shalaev, Purdue Univ. (USA) [9755-49]

Is super-Planckian thermal emission possible in the far field? (Invited Paper), François Marquier, Jean-Jacques Greffet, Institut d'Optique Graduate School (France); Patrick Bouchon, ONERA (France); Giovanni Brucoli, Institut d'Optique Graduate School (France) [9755-50]

Integrated spectral and displacement sensors based on nanomechanical photonic crystals (Invited Paper), Zarko Zobenica, Rob W. van der Heijden, Maurangelo Petruzzella, Francesco M. Pagliano, Tian Xia, Leonardo Midolo, YongJin Cho, Frank W. M. van Otten, Andrea Fiore, Technische Univ. Eindhoven (Netherlands) [9755-51]

Simple analytical treatment of the interaction between light, plasmonic, and quantum resonances: the quasi-normal mode expansion (Invited Paper), Mathias Perrin, Jianji Yang, Univ. Bordeaux 1 (France); Christophe Sauvan, Jean-Paul Hugonin, Lab. Charles Fabry (France); Philippe Lalanne, Lab. Charles Fabry (France) and Univ. Bordeaux 1 (France) [9755-52]

Optical Helmholtz resonators (Invited Paper), Patrick Bouchon, Paul Chevalier, ONERA (France); Fabrice Pardo, Lab. de Photonique et de Nanostructures (France); Riad Haïdar, ONERA (France) [9755-53]

Enhanced second-harmonic generation from magnetic resonance in AlGaAs nanoantennas (Invited Paper), Costantino De Angelis, Andrea Locatelli, Luca Carletti, Univ. degli Studi di Brescia (Italy); Oleksandr Stepanenko, Giuseppe Leo, Univ. Paris 7-Denis Diderot (France); Giuseppe Marino, Nicolas Olivier, Anatoly V. Zayats, King's College London (United Kingdom) ... [9755-54]