

Gene Tsvid

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Work Experience

Postdoctoral position at the University of Wisconsin-Madison, Madison, WI, 12/2012-now

- Design, fabrication and testing of microfluidic substrates for presentation of long DNA molecules for optical mapping of genomes

Laser engineer at Alflight, Madison, WI, 8/2012-11/2012

- Design, fabrication and testing of high power GaAs and InP based edge emitting and surface emitting distributed feedback lasers for fiber pumping applications

Laser engineer at AdTech Optics, Industry, CA, 9/2011-7/2012

- Study of effects of device geometry and doping on internal loss and lasing wavelength of QC lasers
- Design of new quantum cascade lasers (QCL) and improvement of current designs
- Development of performance and design databases and tools of their statistical analysis

NSF innovation award industrial postdoctoral position from Princeton University under mentorship of Prof. C. Gmachl with industrial partner AdTech Optics, Industry, CA, 9/2010- 9/2011, (annual contract)

- QCL band structure design (developed band structure calculation code, GUI, and design metrics)
- Waveguide design (developed optical properties and optical mode simulation)

Postdoctoral position in optoelectronics group with Prof. G. Belenky, University of Stony Brook, NY 8/2009- 9/2010, (annual contract)

- Design, fabrication and testing of Type-I GaSb-based lasers with increased hole confinement
- Material characterization with XRD reciprocal maps, AFM and photoluminescence of metamorphic type I GaSb-based midinfrared lasers for 3-4 μm spectral range

Postdoctoral position in biophotonics with Prof. G. Timp, University of Illinois at Urbana-Champaign, 9/2008- 8/2009, (annual contract)

- Imaging of redox potential variations in vivo in tumorigenic/control cells with fluorescent FRET redox biosensor
- Prototype tissue engineering, cell positioning with optical tweezers and cell signaling studies

Research Assistant with Profs. D. Botez, L. Mawst and F. Cerrina University of Wisconsin-Madison, 6/2001- 9/2008

- Spectral gain and radiative efficiency measurements in quantum well and quantum dot semiconductor lasers using multisegmented devices
- Design and fabrication process development of intersubband quantum box laser (IQBL) in both GaAs/AlGaAs and InGaAs/InAlAs/InP material systems
- Simulation of wall-plug efficiency of IQBL and intersubband quantum cascade lasers
- Design and characterization of dilute nitride type-II W quantum well lasers
- Designed, fabricated by e-beam lithography and tested holographic diffuser for optical maskless DNA chip synthesizer
- Study of line edge roughness of chemically amplified resist vs. PMMA in electron beam lithography
- Simulation of x-ray propagation and image formation in synchrotron x-ray, EUV lithography system

Education

PhD Electrical Engineering, University of Wisconsin-Madison, 8/2008

Solid State Electronics and Photonics (major), Mathematics (minor)

Advisors: Profs. D. Botez, L. Mawst and F. Cerrina

Thesis: "Spectral gain measurements of quantum confined emitters, and design and fabrication of intersubband quantum box laser structures"

MS in Physics, Moscow Institute of Physics and Technology, Russia, 1998 <http://phystech.edu/>

Skills and Miscellaneous

- Lithography: Optical, electron beam (JEOL, Leica, Nabity, 7 years), EUV, soft, x-ray
- Lithography related simulation: image formation in X-ray, EUV, rigorous coupled-wave analysis (RCWA)
- Deposition: sputtering, evaporation, oxidation, PECVD, LPCVD
- Etching: ICP, ECR process development in compound semiconductor structures
- Rapid thermal annealing, precision scribe, die attacher and wire bonding
- Characterization: metrology scanning electron (SEM), atomic force (AFM), energy dispersive x-ray (EDX) microscopy, photo-luminescence
- X-Ray diffraction of epitaxial structures (reciprocal maps), photo/electro-luminescence
- Clean room experience at Wisconsin center for applied microelectronics, Cornell Nanofabrication Facility, Ithaca, NY, Center for Nanoscale Materials Argonne National Lab
- Experienced in fabrication of III-V compound semiconductor lasers on GaAs, InP and GaSb substrates
- Familiarity with CMOS fabrication processes
- Photomask CAD layout and fabrication with e-beam lithography
- My nanogallery: <http://sites.google.com/site/tsgene00/nano.pdf>
- Power, spectral (grating, FTIR, spectrum analyzer) and electrical measurements on semiconductor lasers, TEC, cryostats, temperature and current controllers
- Spectral gain measurements by Hakki-Paoli and multi-segmented method
- Laser modeling and optimization: band structure, waveguide, thermal, rate equations
- Ultrafast, time-resolved life time measurement in semiconductors
- Experiment automation with *Labview*, *Perl* and data analysis in *matlab*)
- Machine shop experience: mills, lathe, *Solidworks* drawings
- Optical tweezers, acousto-optic deflectors, spatial light modulators, niDAQ, niMAQ,
- Fluorescence, FRET, confocal microscopy, flowcytometry, live-cell imaging, cell culture
- **Operating systems:** Unix, Windows, Mac OS X, VMS. **Programming Languages:** Matlab, Labview, Comsol, Perl, Latex, C, C++.
- **CAD and Engineering:** L-edit, Electric, Solidworks, Autocad, HSpice. **Databases:** BerkleyDB, MSAccess, MySQL. **Office:** MSOffice, Acrobat Professional, XEmacs, unix power tools.
- Implemented electronically logged sample history and HTML report generation using MSEXcel, BerkleyDB and Perl for my experiments

Professional Affiliations: Member of SPIE, IEEE and IEEE Photonics Society

Languages: English (fluent), Russian (native). **Work permit:** US permanent resident

Publications: 30 publications in peer-reviewed journals and more than 20 conference presentations

List of Publications

G. Tsvid, X. Wang, J. Fan, C. Gmachl, and M. Troccoli. “Long wavelength quantum cascade lasers for applications in the second atmospheric window at wavelength of 9-11 microns.” In A. A. Belyanin and P. M. Smowton, eds., *Novel In-Plane Semiconductor Lasers XI*, vol. 8277, p. 82771S. SPIE, 2012.

G. Tsvid, X. Wang, J. Fan, and M. Troccoli. “Quantum cascade laser emitting at 10.3 micron for detection of ammonia.” In *Semiconductor Laser Conference (ISLC), 23rd IEEE International*, pp. 84–85. IEEE, 2012.

C. Lin, V. L. Kolossov, G. Tsvid, L. Trump, J. J. Henry, J. L. Henderson, L. A. Rund, P. J. A. Kenis, L. B. Schook, H. R. Gaskins, and G. Timp. “Imaging in real-time with FRET the redox response of tumorigenic cells to glutathione perturbations in a microscale flow.” *Integrative Biology*, vol. 3, pp. 208, 2011.

List of Publications (continued)

- A. Soibel, C. Frez, A. Ksendzov, S. Keo, S. Forouhar, G. Tsvid, G. Kipshidze, L. Shterengas, and G. Belenky. “The 3.0-3.2 μm wavelength range narrow ridge waveguide Sb-based semiconductor diode lasers operating up to 333 K.” *Semiconductor Science and Technology*, vol. 26, pp. 095024, 2011.
- G. Tsvid, T. Hosoda, J. Chen, G. Kipshidze, L. Shterengas, C. Frez, A. Soibel, S. Forouhar, and G. Belenky. “Type-I GaSb based single lateral mode diode ridge lasers operating at room temperature in 3.1-3.2 μm spectral region.” In A. A. Belyanin and P. M. Snowton, eds., *Novel In-Plane Semiconductor Lasers X*, vol. 7953, p. 79531Q. SPIE, 2011.
- D. Botez, G. Tsvid, M. D’Souza, J. C. Shin, Z. Liu, J. H. Park, J. Kirch, L. J. Mawst, M. Rathi, T. F. Kuech, I. Vurgaftman, J. Meyer, J. Plant, G. Turner, and P. Zory. “Intersubband Quantum-Box Lasers: Progress and Potential as Uncooled Mid-Infrared Sources.” In S. Luryi, J. Xu, and A. Zaslavsky, eds., *Future Trends in Microelectronics: From Nanophotonics to Sensors to Energy*, pp. 49–64. Wiley-IEEE Press, 2010.
- J. Chen, T. Hosoda, G. Tsvid, R. Liang, D. Westerfeld, G. Kipshidze, L. Shterengas, and G. Belenky. “Type-I GaSb based diode lasers operating at room temperature in 2 to 3.5 μm spectral region.” In M. Dubinskii and S. G. Post, eds., *Proceedings of SPIE*, vol. 7686, p. 76860S. SPIE, 2010.
- T. Hosoda, G. Kipshidze, G. Tsvid, L. Shterengas, and G. Belenky. “Type-I GaSb-Based Laser Diodes Operating in 3.1- to 3.3 μm Wavelength Range.” *Photonics Technology Letters, IEEE*, vol. 22, pp. 718, 2010.
- N. M. Jokerst, S. Palit, J. Kirch, G. Tsvid, L. Mawst, and T. Kuech. “Thin film edge emitting lasers integrated onto silicon.” In A. A. Belyanin and P. M. Snowton, eds., *Proceedings of SPIE*, vol. 7616, pp. 76160S–12. SPIE, 2010.
- L. Mawst, G. Tsvid, P. Dudley, J. Kirch, J. H. Park, and N. Kim. “Radiative efficiency of MOCVD grown QD lasers.” In B. Witzigmann, F. Henneberger, Y. Arakawa, and M. Osinski, eds., *Proceedings of SPIE*, vol. 7597, pp. 759716–8. SPIE, 2010.
- A. Soibel, C. Frez, A. Ksendzov, Y. Qiu, S. Forouhar, J. Chen, T. Hosoda, G. Kipshidze, L. Shterengas, G. Tsvid, and G. Belenky. “3.2 μm single spatial mode diode lasers operating at room temperature.” In *Lasers and Electro-Optics (CLEO) and Quantum Electronics and Laser Science Conference (QELS)*, pp. 1–2. 2010.
- D. Botez, G. Tsvid, M. D’Souza, M. K. Rathi, J. C. Shin, J. Kirch, L. J. Mawst, T. F. Kuech, I. Vurgaftman, J. Meyer, J. Plant, and G. Turner. “Progress towards intersubband quantum-box lasers for highly efficient continuous wave operation in the mid-infrared.” *Journal of Nanophotonics*, vol. 3, p. 031606, 2009.
- T. Hosoda, J. Chen, G. Tsvid, R. Liang, D. Westerfeld, G. Kipshidze, L. Shterengas, and G. Belenky. “Progress in development of room temperature CW GaSb based diode lasers for 2-3.5 μm spectral region.” *International Journal of High Speed Electronics and Systems*, vol. 20(1), pp. 43, 2009.
- U. M. Mirsaidov, J. Scrimgeour, W. Timp, G. Tsvid, and G. L. Timp. “Diffusion-Sensing versus Quorum Sensing in a Model Biofilm.” *Biophysical Journal*, vol. 96, p. 284a, 2009.

List of Publications (continued)

- S. Palit, J. Kirch, G. Tsvid, L. Mawst, T. Kuech, and N. M. Jokerst. “Low-threshold thin-film III-V lasers bonded to silicon with front and back side defined features.” *Optics Letters*, vol. 34, pp. 2802, 2009.
- M. K. Rathi, G. Tsvid, A. A. Khandekar, J. C. Shin, D. Botez, and T. F. Kuech. “Passivation of Interfacial States for GaAs- and InGaAs/InP-Based Regrown Nanostructures.” *Journal of Electronic Materials*, vol. 38, pp. 2023, 2009.
- M. K. Rathi, G. Tsvid, J. C. Shin, A. A. Khandekar, D. Botez, and T. F. Kuech. “Surface states passivation for and regrowth around nanoposts formed for the fabrication of InP-based intersubband quantum box lasers.” In *Conference Proceedings - International Conference on Indium Phosphide and Related Materials*, pp. 83–86. IEEE, 2009.
- D. Liang, D. C. Hall, J. Y. T. Huang, G. Tsvid, and L. J. Mawst. “Native-oxide-confined high-index-contrast $\lambda=1.15\ \mu\text{m}$ strain-compensated InGaAs single quantum well ridge waveguide lasers.” *Applied Physics Letters*, vol. 93, p. 161108, 2008.
- L. J. Mawst, J. Y. Huang, D. P. Xu, J. Y. Yeh, G. Tsvid, T. F. Kuech, and N. Tansu. “MOCVD-Grown Dilute Nitride Type II Quantum Wells.” *Selected Topics in Quantum Electronics, IEEE Journal of*, vol. 14, pp. 979, 2008.
- S. Palit, G. Tsvid, J. Kirch, J. Y.-T. Huang, L. Mawst, T. Kuech, and N. Jokerst. “Broad area metal/metal bonding of thin film edge emitting lasers to silicon.” In *Conference Proceedings - Lasers and Electro-Optics Society Annual Meeting-LEOS*, pp. 123–124. IEEE, 2008.
- S. Palit, G. Tsvid, J. Kirch, J. Y.-T. Huang, T. Tyler, S.-Y. Cho, N. Jokerst, L. Mawst, and T. Kuech. “Top-bottom stripe thin film InGaAs/GaAsP laser integrated on silicon.” In *Device Research Conference - Conference Digest, DRC*, pp. 137–138. IEEE, 2008.
- G. Tsvid. *Spectral gain measurements of quantum confined emitters, and design and fabrication of intersubband quantum box laser structures*. Ph.D. thesis, University of Wisconsin-Madison, 2008.
- G. Tsvid, J. Kirch, L. J. Mawst, M. Kanskar, J. Cai, R. A. Arif, N. Tansu, P. M. Snowton, and P. Blood. “Spontaneous Radiative Efficiency and Gain Characteristics of Strained-Layer InGaAs/GaAs Quantum-Well Lasers.” *Quantum Electronics, IEEE Journal of*, vol. 44, p. 732, 2008.
- D. Botez, M. D’Souza, G. Tsvid, A. Khandekar, D. Xu, J. C. Shin, T. Kuech, A. Lyakh, and P. Zory. “Intersubband quantum box laser: an update.” In S. Luryi, J. Xu, and A. Zaslavsky, eds., *Future Trends in Microelectronics: Up the Nano Creek*, pp. 380–390. Wiley-IEEE Press, 2007.
- S.-Y. Cho, S. Palit, D. Xu, G. Tsvid, N. Jokerst, L. Mawst, and T. Kuech. “Strain compensated InGaAs/GaAsP single quantum well thin film lasers integrated onto Si substrates.” In *Conference Proceedings - Lasers and Electro-Optics Society Annual Meeting-LEOS*, pp. 829–830. IEEE, 2007.
- G. Tsvid, J. Kirch, L. J. Mawst, M. Kanskar, J. Cai, R. A. Arif, N. Tansu, P. M. Snowton, and P. Blood. “Radiative Efficiency of InGaAs/InGaAsP/GaAs Quantum Well Lasers.” In *Lasers and Electro-Optics Society, 2007. LEOS 2007. The 20th Annual Meeting of the IEEE*, pp. 313–314. 2007.

List of Publications (continued)

G. Tsvid, M. D'Souza, D. Botez, B. Hawkins, A. Khandekar, T. Kuech, and P. Zory. "Towards intersubband quantum box lasers: Electron-beam lithography update." *Journal of Vacuum Science & Technology B*, vol. 22, pp. 3214, 2004.

Y. S. Ma, G. Tsvid, and F. Cerrina. "Line edge roughness of sub-100 nm dense and isolated features: Experimental study." *Journal of Vacuum Science & Technology B*, vol. 21, pp. 3124, 2003.

M. Khan, G. Han, G. Tsvid, T. Kitayama, J. Maldonado, and F. Cerrina. "Can proximity x-ray lithography print 35 nm features? Yes." *Journal of Vacuum Science and Technology B: Microelectronics and Nanometer Structures*, vol. 19, pp. 2423, 2001.

A. N. Artemiev, I. N. Bushev, V. A. Kolyasnikov, G. A. Kovachov, O. E. Latish, V. V. Martynenko, V. P. Moryakov, B. I. Nikitin, D. G. Odintsov, S. S. Peredkov, T. Y. Rakhimbabaev, V. G. Stankevitch, E. S. Tzvid, M. Schmidt, A. Schmidt, and et al. "Deep X-ray Lithography beamline at the Kurchatov Synchrotron Radiation Source: First results." *Nuclear Instruments & Methods in Physics Research, Section A: Accelerators, Spectrometers, Detectors and Associated Equipment*, vol. 405, pp. 496, 1998.

References

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