

Arvind P. Ravikumar

CONTACT INFORMATION	Dept. of Energy Resources Engineering Stanford University Green Earth Sciences 050 367 Panama St. Stanford, CA 94305-2220	<i>Email:</i> arvindr@stanford.edu <i>Voice:</i> (650) 736-3491 <i>Twitter:</i> @arvindpawan1 <i>WWW:</i> http://www.arvindravikumar.com <i>Updated:</i> 10 October, 2017
CURRENT POSITION	Stanford University, Stanford, CA 94305 <ul style="list-style-type: none">• Post-doctoral Fellow, Department of Energy Resources Engineering• Advisor: Adam Brandt	
RESEARCH INTERESTS	Energy Transitions, Energy and climate policy, Natural gas sector, Methane emissions, Role of natural gas in India, energy-economic modeling, Life-cycle analysis	
EDUCATION	Princeton University, Princeton, NJ 08544 <ul style="list-style-type: none">• Ph.D. (2015) Electrical Engineering• Minor: Energy and Climate Policy, Woodrow Wilson School of Public Policy and International Affairs• Dissertation title: II-VI Materials based high performance intersubband devices• Advisor: Claire F. Gmachl Birla Institute of Technology and Science, Pilani, India <ul style="list-style-type: none">• M.Sc. (Honors) Physics (2010)• B.E. (Honors) Electrical Engineering (2015)	
EMPLOYMENT HISTORY	<ul style="list-style-type: none">• 2014-2015: Senior Fellow, The McGraw Center for Teaching and Learning, Princeton University• 2014: Graduate intern, Sandia National Laboratories, Albuquerque, NM• 2013-2015: Fellow, Princeton Climate and Energy Scholars, Princeton Environmental Institute, Princeton University• 2012-2015: Teaching Assistant, Princeton University• 2011-2015: Graduate Student Researcher, Princeton University	
GRANTS AND AWARDS	12 2017: \$250,000 Stanford Natural Gas Initiative and Environmental Defense Fund, Joint project proposal to fund field studies (co-wrote with post-doctoral advisor). 11 2015: \$200,000 National Science Foundation, Accelerating Innovation Research: Technology Translation (AIR:TT) program (co-wrote with Ph.D. advisor). 10 2014: \$50,000 National Science Foundation grant for student-led independent project. 9 2014: \$1,000 Newport graduate award in photonics, Princeton University. 8 2014: Outstanding teaching assistant award, Electrical Engineering, Princeton University. 7 2014: Graduate teaching fellowship, McGraw Center for Teaching and Learning, Princeton University. 6 2013: \$5,000 III-place, 8 th Annual Innovation Forum, Keller Center for Innovation, Princeton University. 5 2013: \$1,000 Princeton Climate and Energy Scholars Research Grant 4 2010: \$57,000 Stanford University Engineering fellowship (declined). 3 2010: \$61,000 Princeton University Engineering fellowship.	

- 2 2010: Best outgoing student, Department of Physics, BITS-Pilani.
 1 2010: R.S.C. best undergraduate research award, BITS-Pilani.

PEER-REVIEWED
 PUBLICATIONS

- 20 **Ravikumar, A.P.**, and Brandt, A.R. (2017). Distributional impacts of methane emissions on the greenhouse gas footprint of the electricity sector. In review: *Nature Energy*.
- 19 Kaya, Y., **Ravikumar, A.P.**, Chen, G., Tamargo, M.C, Shen, A., and Gmachl, C.F. (2017). Absolute Temperature Sensing by a Two-band ZnCdSe/ZnCdMgSe Quantum Well Infrared Photodetector. In review: *Applied Physics Letters*.
- 18 **Ravikumar, A.P.**, and Brandt, A.R. (2017). Does size matter? The value of methane leak quantification in natural gas systems. In review: *Environmental Research Letters*.
- 17 **Ravikumar, A.P.**, Wang, J., McGuire, M., Bell, C., Zimmerle, D., and Brandt, A.R. (2017). Good versus Good Enough? Empirical tests of methane leak detection sensitivity of a commercial infrared camera. In review: *Environmental science & Technology*.
- 16 **Ravikumar, A.P.**, Brandt, A.R. (2017). **Designing better methane mitigation policies: the challenge of distributed small sources in the natural gas sector.** *Environmental Research Letters* **12** 044023.
 Media Coverage: Anthropocene Magazine, E&E News, Natural Gas Intel, SF Gate, Houston Chronicle, IEEE Spectrum
- 15 **Ravikumar, A.P.**, Wang, J., Brandt, A.R. (2017). **Are optical gas imaging technologies effective for methane leak detection?** *Environmental Science & Technology* **51** 718.
 Media coverage: The Conversation
- 14 **Ravikumar, A.P.**, Sivco, D., Gmachl, C.F. (2016). **Wavelength independent normal-incidence detection for intersubband infrared detectors.** *Optics Express* **24** 25269.
- 13 Kemp, C.E., **Ravikumar, A.P.**, Brandt, A.R. (2016). **Comparing natural gas leakage detection technologies using an open-source virtual gas field simulator.** *Environmental Science & Technology* **40** 4546.
- 12 Garcia, T.A., **Ravikumar, A.P.**, Tamargo, M.C., Gmachl, C.F. (2016). **II-VI quantum cascade emitters in the 6-8 μm range.** *Physica Status Solidi B* **253** 1494.
- 11 Chen, G., Kaya, Y., **Ravikumar, A.P.**, Tamargo, M.C., Gmachl, C.F. (2015). **Growth and characterization of ZnCdSe/ZnCdMgSe two-color quantum well infrared photodetectors.** *Physica Status Solidi C* **13** 673.
- 10 **Ravikumar, A.P.**, De Jesus, J., Tamargo, M.C., Gmachl, C.F. (2015). **II-VI based mid-infrared broadband quantum cascade detector.** *Applied Physics Letters* **107** 141105.
- 9 Wolf, O., Campione, S., Benz, A., **Ravikumar, A.P.**, Liu, S., Kadlec, E.A., Shaner, E.A., Klem, J.F., Sinclair, M.B., Brener, I. (2015). **Phased-array sources based on non-linear metamaterial nanocavities.** *Nature Communications* **6** 7667.
- 8 **Ravikumar, A.P.**, Garcia, T.A., De Jesus, J., Tamargo, M.C., Gmachl, C. (2014). **High detectivity short wavelength II-VI quantum cascade detector.** *Applied Physics Letters* **105** 051113.
- 7 **Ravikumar, A.P.**, Chen, G., Zhao, K., Tian, Y., Prucnal, P., Tamargo, M.C., Gmachl, C.F., Shen, A. (2013). **Room temperature and high responsivity II-VI short wavelength quantum well infrared photodetector.** *Applied Physics Letters* **102** 161107.
- 6 Shen, A., **Ravikumar, A.P.**, Chen, G., Zhao, K., Alfaro-Martinez, A., Garcia, T., De Jesus, J., Tamargo, M.C., Gmachl, C. (2013). **MBE growth of ZnCdSe/ZnCdMgSe quantum-well infrared photodetectors.** *Journal of Vacuum Science & Technology B* **31** 03C113.
- 5 De Jesus, J., Garcia, T.A., Dhomkar, S., **Ravikumar, A.P.**, Gmachl, C., Shen, A., Ferizovic, D., Munoz, M., Tamargo, M.C. (2013). **Characterization of three-well active region of a quantum cascade laser using contactless electroreflectance.** *Journal of Vacuum Science & Technology B* **31** 03C134.

- 4 Garcia, T.A., Hong, S., Gao, Y., Tamargo, M., De Jesus, J., Deligiannakis, V., **Ravikumar, A.P.**, Gmachl, C., Shen, A. (2013). **Improved electrical properties and crystalline quality of II-VI heterostructures for quantum cascade lasers.** *Journal of Vacuum Science & Technology B* **31** 03C133.
- 3 **Ravikumar, A.P.**, Alfaro-Martinez, A., Chen, G., Zhao, K., Tamargo, M.C., Gmachl, C.F., Shen, A. (2012). **ZnCdSe/ZnCdMgSe quantum well infrared photodetector.** *Optics Express* **20** 22391.
- 2 Dhara, S., Solanki, H.S., **Ravikumar, A.P.**, Singh, V., Sengupta, S., Chalke, B.A., Dhar, A., Gokhale, M., Bhattacharya, A., Deshmukh, M.M. (2011). **Tunable thermal conductivity in defect engineered nanowires at low temperatures.** *Physical Review B* **84** 121307.
- 1 Dhara, S., Sengupta, S., Solanki, H.S., Maurya, A., **Ravikumar, A.P.**, Gokhale, M.R., Bhattacharya, A., Deshmukh, M.M. (2011). **Facile fabrication of lateral nanowire wrap-gate devices with improved performance.** *Applied Physics Letters* **99** 173101.

ACTIVE
COLLABORATIONS

- 1 Academic Institutions
 - Prof. Michael Wara, Stanford Law School, Stanford University, CA
 - Prof. Daniel Zimmerle, Colorado State University, Fort Collins, CO
 - Prof. Joule Bergerson, University of Calgary, Calgary, AB
 - Prof. Tony Bi, University of British Columbia, Vancouver, BC
 - Sandia National Laboratories, Albuquerque, NM
- 2 Businesses and Non-profits
 - Environmental Defense Fund, Austin, TX
 - Seven Generations Energy, Calgary, AB
 - Southwestern Energy, Oklahoma City, OK
 - ONE Future Coalition, Houston, TX
- 3 Government Agencies
 - Environmental Protection Agency, Washington D.C., USA
 - California Air Resources Board, Sacramento, CA, USA
 - Environment and Climate Change Canada, Gatineau, QC, Canada

INVITED
TALKS &
SEMINARS

- 8 Energy and Climate Decision Making Center Seminar, Carnegie Mellon University, Pittsburg, PA, February 2018.
- 7 Department of Environmental Studies Seminar, San Jose State University, San Jose, CA, October 2017.
- 6 Andlinger Center for Energy and Environment and Department of Electrical Engineering Seminar, Princeton University, Princeton, NJ, October 2017.
- 5 U.S. Environmental Protection Agency (Webinar), Washington D.C., April 2017
- 4 One Future Energy Coalition (Webinar), Houston, TX, April 2017.
- 3 Department of Energy Resources Engineering Seminar, Stanford University, Stanford, CA, February 2017.
- 2 California Air Resources Board, Sacramento, CA, January 2017.
- 1 US Workshop on the Physics and Chemistry of II-VI materials, Chicago, IL, October 2013.

TEACHING AND
MENTORING

- **Department of Energy Resources Engineering**, Stanford University
 - 2017–Present: Advising Ms. Sindhu Sridharan on her Masters’ thesis project performing field studies of methane leak detection technologies.
 - 2017–Present: Advising Mr. Daniel Roda-Stuart on his Masters’ thesis project on life-cycle analysis of LNG use in China with natural gas from upstream facilities in Alberta, Canada.

- 2016–Present: Advising Mr. Jingfan Wang on his Ph.D. dissertation project on machine learning approaches to methane leak detection using infrared cameras
- 2015–2016: Instructor for effective mentoring workshop for graduate students and post-doctoral scholars, Vice-Provost for Teaching and Learning, Stanford University.
- 2015–2016: Mentor, Summer Undergraduate Research in Geoscience and Engineering (SURGE) program (Ms. Jessica Jagdeo, University of Florida)
- 2015–2016: Mentor, Stanford Earth Summer Undergraduate Research (SESUR) program (Mr. Stephen Spears, Stanford University)
- 2015–2016: Mentor, Summer Undergraduate Program on Energy Research (SUPER) (Mr. Matt Miccioli, Stanford University)
- **Department of Electrical Engineering, Princeton University**
 - 2012–2014: Lead Teaching Assistant, ELE 208 - Electronic Materials and Devices. Duties included course design, assignments, labs, and weekly precepts.
 - 2011–2014: Mentor, MIRTHER Research Experience for Undergraduates (REU) summer program, Princeton University (8 students)
 - 2012–2015: Mentor, Junior independent work, Electrical Engineering, Princeton University (2 students)
 - 2014–2015: Advised Mr. Akshay Goel on his senior thesis as part of his degree requirements in Electrical Engineering at Princeton University (1 student)
 - 2011–2015: Volunteer at various science outreach activities at local science festivals and high schools
- **McGraw Center for Teaching and Learning, Princeton University**
 - 2014–2015: Senior graduate teaching fellow
 - 2014–2015: Led University-wide training for new graduate assistants in instruction

LEADERSHIP AND
PROFESSIONAL
SERVICE

- 2017: Post-doctoral representative from Energy Resources Engineering for the School of Earth Sciences Strategic Planning Initiative, Stanford University
- 2017: Session Chair, American Geophysical Union Fall Meeting, New Orleans, LA, USA
- 2016: Rising Environmental Leaders Program, Woods Institute for the Environment, Stanford University
- 2016: Facilitator, Management Matters workshop, Vice-Provost for Graduate Education, Stanford University
- 2015–2017: Founder and Associate Editor, **Highwire Earth**, Princeton University
- 2015: Committee Member, President’s task force on diversity, inclusion and equity, Princeton University
- 2014–2015: Executive committee, Council of the Princeton University Community
- 2012–2014: Steering committee member, Princeton Institute for the Science and Technology of Materials (PRISM) cleanroom user committee, Princeton University
- 2012: Organizing committee, 12th International conference on intersubband transitions in quantum wells (ITQW), Lake George, NY
- 2011–2012: Graduate student council, Electrical Engineering, Princeton University

CONFERENCE
PRESENTATIONS

- 36 J. Wang, **A.P. Ravikumar**, M. McGuire, C. Bell, L.P. Tchampi, and A.R. Brandt (2017). Two-stream Convolutional Neural Network for Methane Emissions Quantification. *American Geophysical Union Fall Meeting*, New Orleans, LA, December 2017.

- 35 D. J. Roda-Stuart, **A.P. Ravikumar**, and A.R. Brandt (2017). Impact of Methane Leak Detection and Repair Programs: Determining Pre- and Post-Survey Emissions Profiles. *American Geophysical Union Fall Meeting*, New Orleans, LA, December 2017.
- 34 **A. P. Ravikumar**, J. Wang, M. McGuire, C. Bell, and A.R. Brandt (2017). Of Detection Limits and Effective Mitigation: The Use of Infrared Cameras for Methane Leak Detection. *American Geophysical Union Fall Meeting*, New Orleans, LA, December 2017.
- 33 B. Nicholson, K.A. Klise, C.D. Laird, **A.P. Ravikumar**, and A.R. Brandt (2017). Optimization of Emissions Sensor Networks Incorporating Tradeoffs Between Different Sensor Technologies. *American Geophysical Union Fall Meeting*, New Orleans, LA, December 2017.
- 32 **A.P. Ravikumar**, and A.R. Brandt (2017). The role of prescriptive policies in mitigating methane emissions from the oil and gas sector. *35th USAEE/IAEE North American Conference*, Houston, TX, November 2017.
- 31 **A.P. Ravikumar**, and A.R. Brandt (2017). Distributional impacts of methane emissions on the GHG footprint of the electricity sector. *Energy Policy Research Conference*, Park City, UT, September 2017.
- 30 **A.P. Ravikumar**, J. Wang, and A.R. Brandt (2016). Is optical gas imaging effective for detecting fugitive methane emissions? A technological and policy perspective. *American Geophysical Union Fall Meeting*, San Francisco CA, December 2016.
- 29 J. Jagdeo, **A.P. Ravikumar**, E. Grubert, and A. R. Brandt (2016). A Holistic Assessment of Energy Production: Environmental, Economic, and Social Impacts of Hydraulic Fracturing in Williams County, North Dakota. *American Geophysical Union Fall Meeting*, San Francisco CA, December 2016.
- 28 Y. Kaya, **A.P. Ravikumar**, G. Chen, A. Shen, M.C. Tamargo, and C. Gmachl (2016). Absolute temperature sensing by a two-color ZnCdSe/ZnCdMgSe detector. *U.S. Workshop on the Physics and Chemistry of II-VI materials*, Baltimore MD, October 2016.
- 27 Y. Kaya, **A.P. Ravikumar**, G. Chen, M.C. Tamargo, A. Shen, and C. Gmachl (2016). Multi-leads, two-color ZnCdSe/ZnCdMgSe based quantum well infrared photodetectors. *Conference on Lasers and Electro-Optics (CLEO)*, San Jose CA, June 2016.
- 26 Y. Kaya, **A.P. Ravikumar**, G. Chen, M.C. Tarmargo, A. Shen, and C. Gmachl (2016). Multi-terminal two-color ZnCdSe/ZnCdMgSe based quantum well infrared photodetector. *American Physical Society March Meeting*, Baltimore MD, March 2016.
- 25 J. De Jesus, T.A. Garcia, **A.P. Ravikumar**, C.F. Gmachl, and M. C. Tamargo (2015). II-VI semiconductor based broadband quantum cascade detectors. *North American Conference on Molecular Beam Epitaxy (NAMBE)*, Riviera Maya, Mexico, October 2015.
- 24 J. De Jesus, T.A. Garcia, **A.P. Ravikumar**, C.F. Gmachl, and M.C. Tamargo (2015). II-VI broadband quantum cascade detectors. *17th International Conference on II-VI compounds and Related Materials (II-VI 2015)*, Paris, France, September 2015.
- 23 G. Chen, **A.P. Ravikumar**, T. Garcia, J. De Jesus, M. C. Tamargo, C. Gmachl, and A. Shen (2015). Growth and characterization of ZnCdSe/ZnCdMgSe two-color quantum well infrared photodetectors. *17th International Conference on II-VI compounds and Related Materials (II-VI 2015)*, Paris, France, September 2015.
- 22 **A.P. Ravikumar**, T.A. Garcia, J. De Jesus, M.C. Tamargo, and C. Gmachl (2015). Long wave, room temperature II-VI based quantum cascade emitters. *Conference on Lasers and Electro-Optics (CLEO)*, San Jose CA, June 2015.
- 21 O. Wolf, S. Campione, A. Benz, **A.P. Ravikumar**, S. Liu, E.A. Kadlec, E. Shaner, J.F. Klem, M.B. Sinclair, and I. Brener (2015). Coherent second harmonic generation in a quantum well metasurface coupled system. *Conference on Lasers and Electro-Optics (CLEO)*, San Jose CA, June 2015.

- 20 O. Wolf, S. Campione, A. Benz, **A.P. Ravikumar**, S. Liu, E.A. Kadlec, E.A. Shaner, J.F. Klem, M.B. Sinclair, and I. Brener (2015). Fully customizable light sources based on second harmonic generation in a quantum well-metasurface coupled system. *Materials Research Society Spring Meeting*, San Francisco CA, April 2015.
- 19 **A.P. Ravikumar**, T.A. Garcia, J. De Jesus, M. Tamargo and C. Gmachl (2014). II-VI based broadband infrared photodetector. *US Workshop on the Physics and Chemistry of II-VI materials*, Baltimore MD, October 2014.
- 18 M. C. Tamargo, T. A. Garcia, J. De Jesus, G. Chen, V. Deligianakis, **A. P. Ravikumar**, C. Gmachl, and A. Shen (2014). Progress in wide bandgap II-VI materials for intersubband devices: quantum cascade detectors. *18th International Conference on Molecular Beam Epitaxy*, Flagstaff AZ, September 2014.
- 17 **A.P. Ravikumar**, G. Chen, T.A. Garcia, J. De Jesus, A. Shen, M. Tamargo, and C. Gmachl (2014). II-VI materials based intersubband infrared detectors. *Quantum Structured Infrared Photodetector International Conference (QSIP 2014)*, Sante Fe NM, July 2014.
- 16 **A.P. Ravikumar**, T.A. Garcia, J. De Jesus, M.C. Tamargo, and C. Gmachl (2014). High detectivity short wavelength II-VI quantum cascade detector. *Conference on Lasers and Electro-Optics (CLEO)*, San Jose CA, June 2014.
- 15 **A.P. Ravikumar**, G. Chen, J. De-Jesus, T. Garcia, M.C. Tamargo, A. Shen, and C. Gmachl (2013). High performance II-VI ZnCdSe/ZnCdMgSe based quantum cascade detectors. *12th International Conference on Intersubband Transitions in Quantum Wells (ITQW 2013)*, Bolton Landing NY, September 2013.
- 14 J. De Jesus, T.A. Garcia, S. Dhomkar, **A.P. Ravikumar**, C.F. Gmachl, A. Shen, and M. C. Tamargo (2013). Use of contactless electroreflectance and modeling techniques to characterize intersubband devices. *12th International Conference on Intersubband Transitions in Quantum Wells (ITQW 2013)*, Bolton Landing NY, September 2013.
- 13 T.A. Garcia, J. De Jesus, **A.P. Ravikumar**, S. Hong, V. Deligiannakis, C.F. Gmachl, A. Shen, and M.C. Tamargo (2013). Growth interruptions in MBE grown II-VI heterostructures for quantum cascade devices. *12th International Conference on Intersubband Transitions in Quantum Wells (ITQW 2013)*, Bolton Landing NY, September 2013.
- 12 **A.P. Ravikumar**, J. De-Jesus, T. Garcia, A. Shen, M.C. Tamargo, and C. Gmachl (2013). ZnCdSe/ZnCdMgSe based mid-infrared quantum cascade emitters. *16th International Conference on II-VI compounds and Related Materials (II-VI 2013)*, Nagahama, Japan, September 2013.
- 11 **A. P. Ravikumar**, A. Shen, G. Chen, K. Zhao, Y. Tian, P. Prucnal, M. Tamargo, and C. Gmachl (2013). High performance quantum-well infrared photodetectors made from wide band-gap II-VI semiconductors. *16th International Conference on II-VI compounds and Related Materials (II-VI 2013)*, Nagahama, Japan, September 2013.
- 10 **A.P. Ravikumar**, G. Chen, K. Zhao, Y. Tian, P. Prucnal, M. Tamargo, C.F. Gmachl, and A. Shen (2013). Room temperature and high responsivity short wavelength II-VI quantum well infrared photodetector. *Conference on Lasers and Electro-Optics (CLEO)*, San Jose CA, June 2013.
- 9 **A.P. Ravikumar**, G. Chen, K. Zhao, Y. Tian, P. Prucnal, M. Tamargo, C.F. Gmachl, and A. Shen (2013). High performance II-VI mid-wave quantum well infrared photodetector. *International Symposium on Photoelectronic Detection and Imaging (ISPDI)*, Beijing, China, June 2013.
- 8 J. De Jesus, T.A. Garcia, S. Dhomkar, **A.P. Ravikumar**, C.F. Gmachl, M.C. Tamargo, and A. Shen (2013). Contactless electroreflectance characterization of a triple asymmetric coupled quantum well active region of a ZnCdMgSe-based quantum cascade laser. *American Physical Society March Meeting*, Baltimore MD, March 2013.

- 7 T.A. Garcia, J. De Jesus, **A.P. Ravikumar**, M.C. Tamargo, C.F. Gmachl, and A. Shen (2013). Material improvements of ZnCdSe/ZnCdMgSe heterostructures for quantum cascade laser applications with incorporation of growth interruptions during MBE growth. *American Physical Society March Meeting*, Baltimore MD, March 2013.
- 6 A. Shen, **A.P. Ravikumar**, A. Alfaro-Martinez, G. Chen, K. Zhao, T. Garcia, J. De Jesus, M.C. Tamargo, and C. Gmachl (2012). MBE growth of ZnCdSe/ZnCdMgSe quantum well infrared photodetectors. *North American Conference on Molecular Beam Epitaxy (NAMBE)*, Atlanta GA, October 2012.
- 5 T.A. Garcia, J. De Jesus, S. Dhomkar, R. Moug, **A.P. Ravikumar**, V. Deligiannakis, C. Gmachl, and M. Tamargo (2012). Improvements in electrical properties and crystalline quality of ZnCdSe/ZnCdMgSe heterostructures for quantum cascade laser applications. *North American Conference on Molecular Beam Epitaxy (NAMBE)*, Atlanta GA, October 2012.
- 4 J. De Jesus, T.A. Garcia, S. Dhomkar, **A.P. Ravikumar**, C. Gmachl, and M.C. Tamargo (2012). Characterization of quantum cascade laser active regions using contactless electroreflectance. *North American Conference on Molecular Beam Epitaxy (NAMBE)*, Atlanta GA, October 2012.
- 3 **A.P. Ravikumar**, Joel de Jesus, Thor Garcia, Peter Taylor, Samantha Essig, Heather Sandfort, Aidong Shen, Maria Tamargo, and Claire Gmachl (2012). II-VI short wavelength intersubband devices. *International Quantum Cascade Laser School and Workshop (IQCLSW)*, Vienna, Austria, September 2012.
- 2 **A.P. Ravikumar**, Adrian Alfaro-Martinez, Guopeng Chen, Kuaile Zhao, Maria C. Tamargo, Claire Gmachl and Aidong Shen (2012). A II-VI quantum well infrared photodetector. *Conference on Lasers and Electro-Optics (CLEO)*, San Jose CA, May 2012.
- 1 **A.P. Ravikumar**, A. Alfaro-Martinez, G. Chen, K. Zhao, M.C. Tamargo, C. Gmachl and A. Shen (2012). A II-VI quantum well infrared photodetector. *Consortium for Spectroscopic Sensor Systems (CoS3) Spring workshop*, Princeton NJ, April 2012.

TECHNICAL
REPORTS

1. **Ravikumar, A.P.**, Chou, C., Jhaveri, J., Baldwin, J., Hanna, P., Keller, K., Peng, W., Rabin, S., Trierweiler, A., Wang, T., Socolow, R. (2016) **Nuclear energy from magnetic confinement fusion** *Energy Technology Distillate Series* Andlinger Center for Energy and the Environment, Princeton University.

PATENTS

1. A.P. Ravikumar, M.C. Tamargo, A. Shen, and C. Gmachl (2014). II-VI materials based short and long wave Quantum Well Infrared Photodetectors. **US 14/185,404**, February 2014.

AD-HOC JOURNAL
REVIEW

Environmental Research Letters, Environmental Science & Technology, Applied Physics Letters, Journal of Applied Physics, Electronic Letters, Optics Letters, Optics Express, Laser and Photonics Reviews, Progress in Photovoltaics: Research and Applications, Infrared Physics and Technology

REFERENCES

1. **Adam R. Brandt**
Assistant Professor, Energy Resources Engineering, Stanford University
abrandt@stanford.edu
2. **Claire F. Gmachl**
Eugene Higgins Professor of Electrical Engineering, Princeton University
cgmachl@princeton.edu
3. **Maria C. Tamargo**
Professor, Chemistry and Biochemistry, The City College of New York, CUNY
tamar@sci.cuny.cuny.edu