Reyu SAKAKIBARA

EPFL STI IEM PV-LAB
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Postdoctoral scientist working on photovoltaic research, excited to apply my broad skillset (fabrication, characterization, modeling, analysis) to cutting-edge R&D in photonics or renewable energy.

EDUCATION

2/2015 – 9/2021 **Doctor of Philosophy in Electrical Engineering, MIT**

Worked in Dr. Ivan Čelanović's lab on high-performance thermophotovoltaic systems.
Doctoral Thesis: *High-performance metallo-dielectric photonic crystals: a practical emitter for thermophotovoltaic generators*
Classes include optoelectronics, programming, design of high temperature materials

8/2012 – 1/2015 **Master of Science in Electrical Engineering, MIT**

Worked in Dirk Englund's lab on diamond sensing. Master thesis: *Electrochemical modulation of fluorescence of nitrogen vacancy centers in nanodiamonds*
Classes include fundamentals of photonics, electromagnetism and optics, solid state physics, numerical simulation, applied quantum and statistical physics (GPA 4.9/5.0)

8/2008 – 5/2012 **Bachelor of Science in Chemical Biology, University of California, Berkeley, USA**

Classes include: organic chemistry with labs, physical chemistry with labs, inorganic chemistry, computational chemistry; quantum mechanics, statistical mechanics, classical mechanics, electromagnetics, solid state physics; molecular and cell biology; symbolic programming
High Honors, GPA 3.92/4.0, Minor in Physics

WORK EXPERIENCE

Since 3/2023 **Postdoctoral scientist, *PV-Lab***
École Polytechnique Fédérale de Lausanne, Neuchâtel, Switzerland

- Studying contact formation, using electron microscopy, of copper-metallized, TOPCon (tunnel oxide passivated contact) style, silicon-based photovoltaic structures

11/2021 – 2/2023 **Senior Process Engineer**
nLIGHT Inc., Vancouver, WA

- Participated in the development of next generation semiconductor lasers by proposing new designs, fabricating prototype wafers, analyzing device data, and presenting team-level progress reports to other stakeholders
- Analyzed device data to devise improvements to current generation processes that led to increases in device efficiency
- Gathered equipment usage logs and constructed models to predict maintenance timelines and avoid downtime
- Assumed responsibility for part of the production process: monitored quality, addressed equipment issues, coordinated with production partners, planned capacity, and supervised and mentored production staff

6/2017 – 9/2021 **Research Assistant, *Čelanović Group***
Institute for Soldier Nanotechologies (ISN), MIT

- Designed, fabricated, characterized photonic crystal (PhC) emitters enabling up to 37.5% increase in power for portable thermophotovoltaic generators
- Explained experimental emittance spectra using S^4 electromagnetics simulations and leveraged models to optimize PhC parameters
- Developed a planarization and etch back process to control the PhC capping layer thickness, the performance-critical parameter

- Demonstrated high-temperature stability of the PhC for 100 hours, through anneals at 1000ºC in vacuum
- Developed a framework of five key metrics to assess the practicality of emitters for thermophotovoltaics and published a journal paper evaluating the state of the art (*J. Photonics Energy*)

5/2017 – 8/2020 **Fellow, Communication Lab, School of Engineering, MIT**

- Co-developed and co-delivered workshops and presentations for up to 40 attendees, covering topics such as writing thesis proposals, making figures, and crafting research narratives
- Coached ~70 students and postdocs on abstracts, manuscripts, presentations, fellowship and graduate school applications
- Received 25 hours and 6 specialized training sessions in coaching technical communication tasks and professional applications

2/2013 – 5/2017 **Research Assistant, *Englund Group*, Quantum Photonics Laboratory, Research Laboratory of Electronics, MIT**

- Studied the possible mechanisms for the fluorescence response of nanodiamonds (NDs) to applied voltage, by studying NDs in electrochemical cells and interdigitated electrodes, and developing a model based on Fermi-Dirac statistics
- Explored two methods to covalently bind nanodiamonds (NDs) and gold nanoparticles in order to enhance ND fluorescence, by varying reaction conditions and characterizing the sizes and surfaces of reactants and products
- Enhanced an inverted microscope setup by adding wide-field and confocal imaging capabilities, in order to screen for and address individual nanodiamonds

6/2012 – 8/2012 **Intern, *van der Zant Group (Molecular Electronics and Devices Group)* Delft University of Technology, the Netherlands**

- Characterized the effect of oxidation on photoconductance on single electron quantum transport in single PbSe quantum dot junction devices

1/2010 – 5/2012 **Research Assistant, *Zettl Group*, Department of Physics, UC Berkeley**

- Analyzed the composition of epoxy polymer reinforced with functionalized multiwall carbon nanotubes, in order to develop a composite with high tensile strength and toughness
- Synthesized and characterized the porosity of zeolite-templated mesoporous boron nitride for physisorptive hydrogen storage

6/2011 – 8/2011 **Intern, *Parpia Group*, Cornell NanoScale Facility, Cornell University**

- Fabricated and characterized graphene resonators, which were featured as cover art J. Vac. Sci. Technol. B 2011, 29 (5) and used in demonstration of photothermal optomechanics in Nano Lett. 12 (9), 4681-4686

5/2009 – 8/2009 **Intern, *Laboratory of Patricia Thistlethwaite*, School of Medicine, UC San Diego**

- Designed and genotyped DNA probes to image pulmonary hypertension-causing gene expression in mouse embryos

TEACHING EXPERIENCE

9/2016 – 12/2016 **Teaching Assistant, Electromagnetics Electrical Engineering and Computer Science, MIT**

- Planned and taught weekly tutorials, wrote problem set solutions, graded problem sets, held office hours

2/2012 – 5/2012 **Teaching Assistant, Organic Chemistry II**
6/2010 – 8/2010 **College of Chemistry, UC Berkeley**

- Supervised a laboratory section and instructed in organic chemistry techniques (with an emphasis on keeping good notes), held office hours, proctored exams, graded exams and laboratory reports

EXTRACURRICULAR ACTIVITIES

Since 6/2017 **FTIR Equipment steward**, ISN at MIT. Trained tens of students and postdocs

Since 6/2017 **Manuscript reviewer**, Joule, Journal of Photonics for Energy, Applied Physics Letters, Applied Thermal Engineering, Light: Science & Applications, Scientific Reports, Journal of the American Chemical Society

9/2017-9/2021 **Mentee**, Graduate Women at MIT Mentoring Program

2013 – 2014 **Seminar committee co-chair**, MIT EECS Graduate Student Association

2013, 2015 **Mentor**, MIT EECSCon (Undergraduate research conference)

2011 – 2012 **Volunteer**, Bay Area Scientists in Schools, Berkeley, CA

2011 **Co-organizer**, Research Experience for Undergraduates Symposium, UC Berkeley

2010 – 2011 **Volunteer**, LifeLong Medical Clinic, West Berkeley Family Practice, Berkeley, CA

SCHOLARSHIPS AND HONORS

2018 Plenary feature talk (one of three selected from over 100 abstracts), MTL (Microsystems Technology Laboratories) Annual Research Conference (MARC)

2012 – 2015 National Science Foundation Graduate Research Fellowship

5/2012 Erich O. and Elly M. Saegebarth Commencement Prize (awarded to two graduating undergraduates majoring in chemistry or chemical biology), UC Berkeley

SKILLS

LANGUAGES

Native speaker English, Japanese

Intermediate French (approximately B2)

Beginner Spanish

NANOFABRICATION

Very good Lithography: optical, electron beam, interference

Thin film deposition: atomic layer deposition (ALD), chemical vapor deposition (CVD)

Good Reactive ion etching

Wet processing

MATERIALS CHARACTERIZATION

Very good Scanning electron microscopy (SEM)

Fourier-transform infrared spectroscopy (FTIR)

Atomic force microscopy (AFM)

Good Focused ion beam (FIB)

Transmission electron microscopy (TEM, HRTEM)

Ultraviolet–visible spectrophotometry (UV-Vis)

Dynamic light scattering (DLS)

Optical microscopy

Familiar Energy-dispersive X-ray spectroscopy (EDX)

X-ray photoelectron microscopy (XPS)

X-ray diffraction (XRD)

Ellipsometry

Thermogravimetric analysis (TGA)

Thin layer chromatography (TLC)
Nuclear magnetic resonance (NMR)
Raman spectroscopy
Secondary ion mass spectrometry

SIMULATION, DATA ANALYSIS, AND COMPUTING

Very good Python (SciPy, NumPy, Jupyter, Matplotlib, Pandas), S^4 Solver
Familiar Matlab, Inkscape, SQL

PUBLICATIONS

2022 A high-performance, metallodielectric 2D photonic crystal for thermophotovoltaics
Sakakibara et al. Sol. Energy Mater. Sol. Cells, 2022, 238, 111536

2019 Practical emitters for thermophotovoltaics: a review.
Sakakibara et al. J. Photonics Energy, 2019, 9 (3), 032713

2018 Improved Omnidirectional 2D Photonic Crystal Selective Emitter for Thermophotovoltaics.
Sakakibara et al. J. Phys.: Conf. Ser., 2018, 1052, 012056.

2016 Modulation of nitrogen vacancy charge state and fluorescence in nanodiamonds using electrochemical potential.
Co-Author. Karaveli, S. et al. Proc. Natl. Acad. Sci. USA, 2016, 15 (113), 3938-3943.

2012 Photothermal Oscillation and Laser Cooling of Graphene Optomechanical Systems.
Co-Author. Barton, R. A. et al. Nano Lett. 2012, 12 (9), 4681-4686.