

1180 W 29th Street, APT 308
Los Angeles, CA 90007

Alok Ghanekar

(401) 932-1926
alokghanekar@gmail.com

EDUCATION

University of Rhode Island, Kingston, RI

2014 - Dec. 2018

PhD, Mechanical Engineering

Thesis: Photonic metamaterials: spectral control and modulation of nanoscale thermal radiative transport

Indian Institute of Technology Madras, Chennai, India

2006 - 2011

B. Tech. and M. Tech., Mechanical Engineering

RESEARCH EXPERIENCE

Postdoctoral Researcher

University of Southern California

Oct. 2020 - Present

Ongoing research projects with Povinelli Nanophotonics group focusing on application of nanophotonics to attain active and non-reciprocal control of thermal radiation. Primary responsibilities include conducting research, working with graduate students, participating in experiments, collaborating with other researchers, publishing research articles and presenting my research at conferences.

- Demonstrated a violation of Kirchhoff's law of thermal radiation without magneto optics and designed a non-reciprocal infrared thermal emitter with time-dependent permittivity modulation.
- Designed a new scheme to attain dynamic emissivity control using carrier injection in InAs based micro-gratings.
- Helped investigate dynamic photoluminescence in guided mode resonance gratings with monolayer MoS₂ and WS₂.
- Explored tunable, directional emissivity control of thermal radiation using index modulation in meta-atoms.
- Predicted the effect of photonic crystal design on increased mechanical stability of LightSail.

Graduate Research Assistant

University of Rhode Island

2014 - 2018

Conducted research on micro/nano scale thermal radiation to design metamaterials for potential applications in energy conversion systems, sensors and thermal management methods.

- Developed MATLAB based scripts for calculation of thermal radiative properties of metamaterials, multi-layered structures and thermal radiative transport across materials.
- Designed new metamaterials for spectrally selective thermal emitters to be used in near-field and far-field thermo-photovoltaic systems.
- Designed new metamaterials for thermal rectification devices and demonstrated for the first time, the highest attainable rectification efficiencies in near-field and far-field regimes.
- Characterized materials using Scanning Electron Microscope, FTIR spectrometer and measurement of thermal conductivity.
- Authored more than nine peer-reviewed research articles in highly reputed international journals.
- Taught 'Fluid Mechanics' and 'Introduction to MATLAB' classes to undergraduate students as a substitute instructor.
- Instructed 'Thermal and Fluid Sciences Laboratory' sessions to undergraduate students.
- Provided technical guidance and assistance to undergraduate students for Capstone projects.
- Worked as a teaching assistant for *Heat Transfer*, *Fluid Mechanics* and *Thermodynamics* courses.

- Research Assistant **Indian Institute of Technology Madras** 2010 - 2011
- Developed MATLAB based numerical scripts for 2D acoustic simulation of reactive mufflers.
 - Put forward a method of optimization for the design of mufflers using Genetic Algorithm (GA) for desired range of frequencies.

INDUSTRY EXPERIENCE

- Engineer – Engine Performance **Artech LLC (Client: John Deere)** Jan. 2019 – Sept. 2020
- Worked with performance and emissions group on calibration of diesel engines to meet existing and future emissions regulations and application requirements. Primary responsibilities were - running a test cell, planning, coordinating and executing test plans to evaluate engine performance and emissions, analyzing test data and performing engine analysis using 1D models.
- Updated calibration parameters for production engines to meet emissions regulations.
 - Evaluated possible ways to reduce smoke puff during engine cold start.
 - Developed an EGR flow prediction model for 9L diesel engine.
 - Developed a head temperature prediction model using test data.
 - Analyzed the effect of turbine bearing change on engine altitude performance using GT-Power.
 - Analyzed the effect of modified calibration on engine altitude performance.

- Intern – Engine Development **LiquidPiston Inc.** Summer 2017
- Developed a new model for thermal management of X engine rotor.
 - Engaged in supporting development of revolutionary X rotary engines.
 - Upgraded engine simulation models for X engines.

- Assistant Manager **Mahindra** 2013 - 2014
- Completed intake and exhaust system design projects for performance of motorcycle engines.
 - Worked on valve timing optimization for engine performance.
 - Involved in design of mufflers for noise reduction and improving quality of sound.

- Engineer **Cummins Inc.** 2011 - 2013
- Developed 1-D thermodynamic models of diesel and natural gas engines that are used for heavy duty trucks and industrial applications.
 - Involved in engine performance analyses and various trade-off studies.
 - Trained a junior employee for thermodynamic analyses of engines.

HONORS & AWARDS

- *Intellectual Property Recognition Award* (2018), University of Rhode Island.
- *Paul and Margurite Lischio Graduate Fellowship Award* (2017-2018), University of Rhode Island.
- *Sigma Xi Grant-in-Aid of Research Award* (2017).
- *Graduate School Tuition Scholarship* (2016-2017), University of Rhode Island.
- *Sigma Xi Grant-in-Aid of Research Award* (2016).
- *Prof. C. S. Krishnamoorthy Endowment Prize* (2012), IIT Madras.

INVENTION DISCLOSURES

- Zheng Y.; **Ghanekar A.**; Tian Y.; “High Temperature Metamaterial Selective Emitter for Thermophotovoltaics”. (Chinese Patent) Application No. 201710721835.X, Oct. 2017.
- Zheng Y.; **Ghanekar A.**; Xiao G.; “High Contrast Far-Field Radiative Thermal Diode”. U.S. Patent Application filed, Jul. 2018.

JOURNAL PUBLICATIONS

- **Ghanekar A**, Ricci M, Tian Y, Gregory O, Zheng Y. Dynamic optical response of SU-8 upon UV treatment. *Optical Materials Express*. 2018 Jul 1;8(7):2017-25.
- **Ghanekar A**, Ricci M, Tian Y, Gregory O, Zheng Y. Strain-induced modulation of near-field radiative transfer. *Applied Physics Letters*. 2018 Jun 11;112(24):241104 (Editor’s pick).
- Tian Y, **Ghanekar A**, Ricci M, Hyde M, Gregory O, Zheng Y. A Review of Tunable Wavelength Selectivity of Metamaterials in Near-Field and Far-Field Radiative Thermal Transport. *Materials*. 2018 May 22;11(5):862.
- **Ghanekar A**, Tian Y, Ricci M, Zhang S, Gregory O, Zheng Y. Near-field thermal rectification devices using phase change periodic nanostructure. *Optics Express*. 2018 Jan 22;26(2):A209-18.
- **Ghanekar A**, Tian Y, Zhang S, Cui Y, Zheng Y. Mie-Metamaterials-Based Thermal Emitter for Near-Field Thermophotovoltaic Systems. *Materials*. 2017 Jul 31;10(8):885.
- **Ghanekar A**, Xiao G, Zheng Y. High Contrast Far-Field Radiative Thermal Diode. *Scientific Reports*. 2017 Jul 24;7:6339.
- **Ghanekar A**, Ji J, Zheng Y. High-rectification near-field thermal diode using phase change periodic nanostructure. *Applied Physics Letters*. 2016 Sep 19;109(12):123106.
- **Ghanekar A**, Sun M, Zhang Z, Zheng Y. Optimal Design of Wavelength Selective Thermal Emitter for Thermophotovoltaic Applications. *Journal of thermal science and engineering applications*. 2018 Feb 1;10(1):011004.
- **Ghanekar A**, Lin L, Zheng Y. Novel and efficient Mie-metamaterial thermal emitter for thermophotovoltaic systems. *Optics express*. 2016 May 16;24(10):A868-77.
- **Ghanekar A**, Lin L, Su J, Sun H, Zheng Y. Role of nanoparticles in wavelength selectivity of multilayered structures in the far-field and near-field regimes. *Optics express*. 2015 Sep 21;23(19):A1129-39.
- Zheng Y, **Ghanekar A**. Radiative energy and momentum transfer for various spherical shapes: A single sphere, a bubble, a spherical shell, and a coated sphere. *Journal of Applied Physics*. 2015 Feb 14;117(6):064314.
- Tian Y, **Ghanekar A**, Qian L, Ricci M, Liu X, Xiao G, Gregory O, Zheng Y. Near-infrared optics of nanoparticles embedded silica thin films. *Optics express*. 2019 Feb 18;27(4):A148-57.
- Tian Y, **Ghanekar A**, Liu X, Sheng J, Zheng Y. Tunable wavelength selectivity of photonic metamaterials-based thermal devices. *Journal of Photonics for Energy*. 2018 Dec;9(3):032708.
- Tian Y, **Ghanekar A**, Ricci M, Hyde M, Gregory O, Zheng Y. A review of tunable wavelength selectivity of metamaterials in near-field and far-field radiative thermal transport. *Materials*. 2018 May;11(5):862.
- Tian Y, **Ghanekar A**, Qian L, Ricci M, Liu X, Xiao G, Gregory O, Zheng Y. Near-infrared optics of nanoparticles embedded silica thin films. *Optics express*. 2019 Feb 18;27(4):A148-57.

- Liu X, Tian Y, **Ghanekar A**, Zheng Y. Spectral selectivity of multiple nanoparticles doped thin films. *Optics Express*. 2019 Sep 30;27(20):A1591-600.
- Tian Y, Qian L, Liu X, **Ghanekar A**, Xiao G, Zheng Y. Highly effective photon-to-cooling thermal device. *Scientific Reports*. 2019 Dec 17;9(1):1-1.
- Tian Y, Qian L, Liu X, **Ghanekar A**, Liu J, Thundat T, Xiao G, Zheng Y. High-temperature and abrasion-resistant metal-insulator-metal metamaterials. *Materials Today Energy*. 2021 Sep 1;21:100725.
- Tian Y, Liu X, **Ghanekar A**, Zheng Y. Scalable-manufactured metal-insulator-metal based selective solar absorbers with excellent high-temperature insensitivity. *Applied Energy*. 2021 Jan;281:116055
- Liu X, Tian Y, Chen F, Ghanekar A, Antezza M, Zheng Y. Continuously variable emission for mechanical deformation induced radiative cooling. *Communications Materials*. 2020 Dec 4;1(1):1-7.
- Tian Y, Liu X, **Ghanekar A**, Chen F, Caratenuto A, Zheng Y. Blackbody-cavity ideal absorbers for solar energy harvesting. *Scientific Reports*. 2020 Nov 20;10(1):1-7.

CONFERENCE PRESENTATIONS

- **Alok Ghanekar** and Yi Zheng, “Novel Thermal Emitter for Photovoltaic Applications”, TFESC2016-18707, Las Vegas, NV, April 2017.
- **Alok Ghanekar**, Jun Ji, Mingdi Sun, Zongqin Zhang and Yi Zheng, “Enhanced Thermal Rectification of Near-field Thermal Diode Using Surface Gratings”, ASME-IMECE2016, Phoenix, AZ, November, 2016.
- **Alok Ghanekar** and Yi Zheng, “A Mie-metamaterial Based Thermal Emitter for TPV Applications”, ASME-HT2016- 7123, Washington, D.C., July, 2016.
- **Alok Ghanekar** and Yi Zheng, “High Thermal Rectification Diode Using Phase Change Material”, ASME-HT2016-7124, Washington, D.C., July, 2016.
- **Alok Ghanekar**, Laura Lin, Zongqin Zhang, Mingdi Sun and Yi Zheng, “Spectral Tuning of Radiative Heat Transfer Using Nanoparticles”, ASME-HT2016-7493, Washington, D.C., July, 2016.
- **Alok Ghanekar**, Weixing Zhang, Zongqin Zhang and Yi Zheng, “Selective Emission Properties and vdW Energy of Micro/nano-sized Spherical Shapes”, ASME-HT2016- 7494, Washington, D.C., July, 2016.
- **Alok Ghanekar**, Laura Lin, Junwei Su, Hongwei Sun and Yi Zheng, “An Investigation into Role of Nanoparticles in the Thermal Emission from Multiplayer Structures”, TFESC2015- 12855, New York City, NY, August 2015.

JOURNAL REVIEW

Reviewer for *Physical Review Applied*, *Journal of Applied Physics*, *Journal of Optical Society of America A*, *Optics Express*, *Optics Letters*, *Applied Optics*, *Journal of Thermophysics*, *Materials* and *Desalination*.

EDITORIAL WORK

Topical Editor for *Materials* (MDPI)