

## B. REEJA JAYAN, Ph.D.

Carnegie Mellon University  
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### EDUCATION

- Assistant Professor, Mechanical Engineering** 2015-present  
*Courtesy appointments in Materials Science and Engineering, Chemical Engineering, Electrical and Computer Engineering*  
Carnegie Mellon University (CMU), USA
- Postdoctoral Training, Chemical Engineering** 2013-2015  
Massachusetts Institute of Technology (MIT), USA  
**Advisor:** Prof. Karen K. Gleason
- Ph.D., Materials Science and Engineering** 2008-2012  
The University of Texas at Austin (UT-Austin), USA  
*Certification in the Graduate Portfolio Program in Nanoscience and Nanotechnology*  
**Advisor:** Prof. Arumugam Manthiram
- M.S., Electrical Engineering** 2006-2008  
The University of Texas at Austin (UT-Austin), USA  
**Advisors:** Prof. Miguel Jose Yacamán, Prof. Sanjay K. Banerjee
- B.Tech., Electronics and Telecommunication Engineering** 1998-2002  
University of Kerala, India

### AWARDS AND HONORS

- Army Research Office (ARO) Young Investigator Award 2017  
Pittsburgh Magazine 40 Under 40 Award 2017  
The Incline Who's Next:Technology Award – 18 People Transforming Pittsburgh 2017  
Donald L. and Rhonda Struminger Faculty Fellow in Mechanical Engineering 2017  
Berkman Faculty Development Fund 2017  
Air Force Office of Scientific Research (AFOSR) Young Investigator Award 2016  
Wimmer Faculty Fellowship 2016  
Fellow, IMPACT program for advanced post-doctoral training, MIT 2015  
Texas Materials Institute Nominee for the Michael Granoff Outstanding Graduate Student Award, UT-Austin 2012  
Doctoral Fellowship, American Association of University Women (AAUW) 2010  
Cockrell School of Engineering Student Leadership Award, UT-Austin 2010  
Mike Hogg Endowed Doctoral Fellowship, UT-Austin 2010  
H.H. The Maharaja of Cochin Endowment Prize, University of Kerala, India 2002

### PROFESSIONAL EXPERIENCE

- Postdoctoral Associate** 2013-2015

Chemical Engineering, MIT

*Synthesis of functional and conformal polymer films by Chemical Vapor Deposition (CVD) polymerization for hybrid silicon photovoltaics and three-dimensional (3D) lithium ion battery architectures. Successfully led multi-disciplinary and multi-university collaborative projects.*

**Postdoctoral Fellow**

2012-2013

Energy Frontier Research Center (DOE-EFRC), UT-Austin

*Experimental investigation of charge separation and transfer at organic-inorganic interfaces in hybrid polymer photovoltaic devices.*

**Graduate Research Assistant**

2008-2012

Materials Science and Engineering, UT-Austin

*Microwave-assisted, low-temperature synthesis of thin films. Surface modification of lithium ion battery electrode surfaces for enhanced electrochemical performance.*

**Graduate Teaching Assistant**

2008

Electrical and Computer Engineering, UT-Austin

*Assisted in teaching undergraduate courses on Solar Conversion Devices and Solid State Electronics.*

**Graduate Research Assistant**

2006-2008

Electrical and Computer Engineering, UT-Austin

*Synthesis and characterization of ZnO nanostructures for optoelectronic devices*

**Spacecraft Integration Scientist**

2004-2006

Indian Space Research Organization (ISRO), Bangalore, India

*Investigation of materials for electromagnetic and electrostatic shielding of telecommunication sub-systems on spacecrafts.*

**Software Engineer**

2002-2004

Technopark, Kerala, India

*Development of telecommunication software for optical wireless networks*

**RESEARCH EXPERTISE**

- Thin film materials synthesis (metals, polymers, ceramics)
  - Solution phase (sol-gel, microwave chemistry, chemical bath deposition)
  - Vapor phase (chemical vapor deposition (CVD), physical vapor deposition)
  - Low temperature crystallization
  - CVD polymerization (initiated CVD and oxidative CVD)
- Thin film surfaces and interface engineering
  - Uniformity, conformality, composition and morphology control
  - Nanostructuring/nanopatterning
  - Surface modifications
  - Covalent grafting
  - Characterization (analytical, microscopy, spectroscopy, metrology)
- Applications for sustainability (prototype device design, fabrication and testing)
  - Hybrid polymer photovoltaics

- Lithium ion batteries
- Biomolecule sensing

## **PUBLICATIONS, PATENT APPLICATIONS AND PRESENTATIONS**

### **Journal articles** (\* denotes shared first-authorship)

**Number of Citations:** 781, **h-index:** 11, Google Scholar, 12 October 2017

1. N. Nakamura, M. W. Terban, S. J. L. Billinge, **B. Reeja-Jayan**, “Unlocking the structure of mixed amorphous-crystalline ceramic oxide films synthesized under low temperature electromagnetic excitation,” *Journal of Materials Chemistry A* **5**, 18434-18441 (2017) (*Research supervised as faculty at CMU*)
2. N. Nakamura, J. Seepaul, J. Kadane, **B. Reeja-Jayan**, “Design for Low-Temperature Microwave-Assisted Crystallization of Ceramic Thin Films”, *Applied Stochastic Models in Business and Industry*, **33**, 314-321 (2017). (*Research supervised as faculty at CMU*)
3. M. L. Castillo, A. Ugur, H. Sojoudi, N. Nakamura, Z. Liu, F. Lin, R. E. Brandt, T. Buonassisa, **B. Reeja-Jayan**, K. K. Gleason, “Organic Passivation of Silicon Through Multifunctional Polymeric Interfaces”, *Solar Energy Materials and Solar Cells*, **160**, 470-475 (2017). (*Research supervised as faculty at CMU*)
4. D. H. Galvan, G. Alonso, M. Tejeda, A. Torres, **B. Reeja-Jayan**, D. Ferrer, A., Posada-Amarillas, D. Barraza-Jimenez, and M. José-Yacamán, “Experimental and Theoretical Analyses of ZnO Nanoparticles Deposited onto Single-Wall Carbon Nanotubes,” *Fullerenes, Nanotubes and Carbon Nanostructures*, **24**, 541 (2016).
5. N. Chen, **B. Reeja-Jayan**, A. Liu, J. Lau, B. Dunn, and K. K. Gleason, “iCVD Cyclic Polysiloxane and Polysilazane as Nanoscale Thin-Film Electrolyte: Synthesis and Properties”, *Macromolecules Rapid Communications*, **37**, 446 (2016).
6. **B. Reeja-Jayan**, N. Chen, J. Lau, J. A. Kattirtzi, P. Moni, A. Liu, I. G. Miller, R. Kayser, A. P. Willard, B. Dunn, and K. K. Gleason, “A Group of Cyclic Siloxane and Silazane Polymer Films as Nanoscale Electrolytes for Microbattery Architectures”, *Macromolecules*, **48**, 5222 (2015).
7. **B. Reeja-Jayan**, K. A. Koen, R. J. Ono, D. A. Vanden Bout, C. W. Bielawski, and A. Manthiram, “Oligomeric Interface Modifiers in Hybrid Polymer Solar Cell Prototypes Investigated by Fluorescence Voltage Spectroscopy”, *Physcial Chemistry Chemical Physics*, **17**, 10640 (2015).
8. N. Chen\*, **B. Reeja-Jayan\***, J. Lau, P. Moni, A. Liu, B. Dunn, and K. K. Gleason, “Nanoscale, Conformal Polysiloxane Thin Film Electrolytes for Three-Dimensional Battery Architectures”, *Materials Horizons*, **2**, 309 (2015). (*Article selected as back cover*)
9. **B. Reeja-Jayan**, P. Moni, and K. K. Gleason, “Synthesis of Insulating and

- Semiconducting Polymer Films via Initiated Chemical Vapor Deposition”, *Nanoscience and Nanotechnology Letters*, **7**, 33 (2015) (*Invited article for special issue on nanostructured functional polymers*)
10. **B. Reeja-Jayan**, P. Kovacic, R. Yang, H. Sojoudi , A. Ugur, D. H. Kim, C. D. Petruczok, X. Wang, A. Liu, and K. K. Gleason, “A Route towards Sustainability through Engineered Polymeric Interfaces”, *Advanced Materials Interfaces*, **1**, 1400117 (2014) (*Invited review article, selected as frontispiece cover*)
  11. C. L. Wang, C. C. Wang, **B. Reeja-Jayan**, and A. Manthiram, “Low-cost, Mo(S,Se)<sub>2</sub>-free superstrate-type solar cells fabricated with tunable band gap Cu<sub>2</sub>ZnSn(S<sub>x</sub>Se<sub>1-x</sub>)<sub>4</sub> nanocrystal-based inks and the effect of sulfurization”, *RSC Advances*, **3**, 19946-19951 (2013).
  12. **B. Reeja-Jayan**, N. Folse, and A. Manthiram, “Development of Scalable, Low-cost Polymer Solar Cell Test Platform”, *Journal of Solar Energy Engineering*, **135**, 041004 (2013).
  13. **B. Reeja-Jayan** and A. Manthiram, “Effects of Bifunctional Metal Sulfide Interlayers on Photovoltaic Properties of Organic-Inorganic Hybrid Solar Cells”, *RSC Advances*, **3**, 5412-5421 (2013).
  14. **B. Reeja-Jayan**, T. Adachi, R. J. Ono, D. A. Vanden Bout, C. W. Bielawski, and A. Manthiram, “Effect of Interfacial Dipoles on Charge Traps in Organic-Inorganic Hybrid Solar Cells”, *Journal of Materials Chemistry A*, **1**, 3258-3262 (2013).
  15. **B. Reeja-Jayan\***, K. L. Harrison\*, K. Yang, Chih-Liang Wang, A. Yilmaz, and A. Manthiram, “Microwave-assisted Low Temperature Thin Film Growth in Solution”, *Scientific Reports*, **2**, 1003 (2012). (*Highlighted by the Materials Research Society (MRS) on their Materials360 Online news website*)
  16. **B. Reeja-Jayan** and A. Manthiram, “Understanding the Improved Stability of Hybrid Polymer Solar Cells Fabricated with Copper Electrodes”, *ACS Applied Materials & Interfaces*, **3**, 1492-1501 (2011).
  17. Jun Liu, Qiongyu Wang, **B. Reeja-Jayan**, and A. Manthiram, “Carbon-coated High Capacity Layered Li[Li<sub>0.2</sub>Mn<sub>0.54</sub>Ni<sub>0.13</sub>Co<sub>0.13</sub>]O<sub>2</sub> Cathodes”, *Electrochemistry Communications*, **12**, 750-753 (2010).
  18. Jun Liu, **B. Reeja-Jayan**, and A. Manthiram, “Conductive Surface Modification with Aluminum of High Capacity Layered Li[Li<sub>0.2</sub>Mn<sub>0.54</sub>Ni<sub>0.13</sub>Co<sub>0.13</sub>]O<sub>2</sub> Cathodes”, *Journal of Physical Chemistry C*, **114**, 9528-9533 (2010).
  19. **B. Reeja-Jayan** and A. Manthiram, “Influence of Polymer-Metal Interface on the Photovoltaic Properties and Long-term Stability of nc-TiO<sub>2</sub>-P3HT Hybrid Solar Cells”, *Solar Energy Materials and Solar Cells*, **94**, 907-914 (2010).
  20. S. Sepulveda-Guzman, **B. Reeja-Jayan**, E. De la Rosa, U. Ortiz-Mendez, C. Reyes-Betanzo, R. Cruz-Silva, and M. J. Yacaman, “Room-Temperature Deposition of Crystalline Patterned ZnO Films by Confined Dewetting Lithography”, *Applied Surface Science*, **256**, 3386-3389 (2010).
  21. S. Sepulveda-Guzman, **B. Reeja-Jayan**, E. de la Rosa, A. Torres-Castro, V.

Gonzalez-Gonzalez, and M. J. Yacaman, "Synthesis of Assembled ZnO Structures by Precipitation Method in Aqueous Media", *Materials Chemistry and Physics* **115**, 172-178 (2009). (*Selected as top 25 Hottest Articles published between January to March 2009*)

22. **B. Reeja-Jayan**, E. de la Rosa, S. Sepulveda-Guzman, R.A. Rodriguez, and M. J. Yacaman, "Structural Characterization and Luminescence of Porous Single Crystalline ZnO Nanodisks with Sponge-like Morphology", *Journal of Physical Chemistry C* **112**, 240-246 (2008).
23. E. de la Rosa, S. Sepulveda-Guzman, **B. Reeja-Jayan**, A. Torres, P. Salas, N. Elizondo, and M. J. Yacaman, "Controlling the Growth and Luminescence Properties of Well-Faceted ZnO Nanorods", *Journal of Physical Chemistry C* **111**, 8489-8495 (2007).

### Patents (Issued and Pending)

1. "High Capacity Layered Oxide Cathodes with Enhanced Rate Capability", J. Liu , **B. Reeja-Jayan**, A. Manthiram, International Patent Application # PCT/US2011/026776
2. "Low Temperature Microwave-Assisted Thin Film Deposition", **B. Reeja-Jayan**, K. L. Harrison, A. Manthiram, International Patent Application #PCT/US13/54888
3. "Fabrication and Passivation of Silicon Surfaces", R. Yang, **B. Reeja-Jayan**, T. Buonassisi, K. K. Gleason, U.S. Patent No. 9,656,294
4. "Development of Ultra-thin and Conformal Polymer Electrolyte for 3D Batteries", N. Chen, **B. Reeja-Jayan**, B. Dunn, K. Gleason, US Patent Application 14/918,533
5. "Hybrid Materials, Devices, Software, and Platforms for Electrically Responsive Allergen Detection, Monitoring, and Processing", **B. Reeja Jayan**, Aarti Singh, Pulkit Grover, Provisional Patent Application filed by CMU, April 4, 2017.
6. "Electrode Surface Engineering in Lithium Ion Batteries", **B. Reeja Jayan**, Laisuo Su, Provisional Patent Application filed by CMU, July 24, 2017.

### Conference presentations

1. **B. Reeja Jayan**, "Mechanistic Insights into Low Temperature Ceramic Thin Film Growth and Crystallization Using Microwave Radiation", *MS&T17*, Pittsburgh, USA, 09 Oct-12 Oct 2017. (*Invited talk in Rustum Roy Symposium*)
2. Mariela Castillo, Asli Ugur, Hossein Sojoudi, Nathan Nakamura, Zhe Liu, Fen Lin, Riley E. Brandt, Tonio Buonassisi, **B. Reeja Jayan**, Karen K. Gleason "Organic Passivation of Silicon Through Multifunctional Polymeric Interfaces", *Materials Research Society (MRS) Fall Meeting*, Boston, USA, 27 Nov-2 Dec 2016.
3. Maxwell Telmer, Indorica Sutradhar, Bartłomiej Kolodziejczyk, **B. Reeja-Jayan**, "Highly sensitive gluten sensing platform based on conducting polymers bio-functionalized with gluten antibodies", *Annual Meeting of the American Institute of*

*Chemical Engineers (AIChE)*, San Francisco, USA, 13 Nov-18 Nov 2016.

4. **B. Reeja-Jayan**, A. Ugur, M. L. Castillo, T. Buonassisi, and K. K. Gleason, "Surface Passivation of Silicon Solar Cells Using Polymeric Interfaces", *Annual Meeting of the American Institute of Chemical Engineers (AIChE)*, Salt Lake City, USA, 9 Nov-13 Nov 2015.
5. **B. Reeja-Jayan**, A. Ugur, M. L. Castillo, T. Buonassisi, and K. K. Gleason, "Surface Passivation of Inorganic Substrates by Multifunctional Polymeric Interfaces", *Materials Research Society (MRS) Fall Meeting*, Boston, USA, 30 Nov-5 Dec 2014. *(Talk selected as meeting highlight in MRS Meeting Scene e-newsletter)*
6. **B. Reeja-Jayan**, N. Chen, J. Lau, P. Moni, A. Liu, B. Dunn, K. K. Gleason, "Ultra-thin, Conformal Polymer Electrolyte for Three-Dimensional Battery Architectures", *Materials Research Society (MRS) Fall Meeting*, Boston, USA, 30 Nov-5 Dec 2014.
7. **B. Reeja-Jayan**, K. L. Harrison, K. Yang, Chih-Liang Wang, A. Yilmaz, and A. Manthiram, "Experimental and Computational Insights into Microwave-assisted Low-temperature Growth of Thin Films in Solution", *Materials Research Society (MRS) Spring Meeting*, San Francisco, USA, 2-5 Apr 2013.
8. **B. Reeja-Jayan** and A. Manthiram, "Influence of Bond Ionicity on Interfacial Energetics and Photovoltaic Properties of Nanostructured Solid State Hybrid Solar Cells", *Materials Research Society (MRS) Spring Meeting*, San Francisco, USA, 9-13 Apr 2012.
9. **B. Reeja-Jayan**, K. L. Harrison, and A. Manthiram, "Low temperature, Microwave-assisted Deposition of Nanostructured Titanium Dioxide Networks for Flexible Thin Film Devices", *Materials Research Society (MRS) Fall Meeting*, Boston, USA, 28 Nov-2 Dec 2011.
10. K. L. Harrison, **B. Reeja-Jayan**, and A. Manthiram, "Low Temperature Microwave-Assisted Solvothermal Synthesis of TiO<sub>2</sub> Thin Films", *Materials Research Society (MRS) Fall Meeting*, Boston, USA, 28 Nov-2 Dec 2011.
11. **B. Reeja-Jayan** and A. Manthiram, "Understanding the Effect of Interfaces on the Photovoltaic Properties and Long-term Stability of TiO<sub>2</sub> based Hybrid Polymer Solar Cells", *Materials Research Society (MRS) Spring Meeting*, San Francisco, USA, 25-29 Apr 2011.
12. S. Sepulveda-Guzman, E. de la Rosa, **B. Reeja-Jayan**, M. Ramirez, D. Ferrer, X. Gao, and M. J. Yacaman, "Synthesis of Assembled ZnO Structures by Precipitation Method in Aqueous Media", *Materials Research Society (MRS) Spring Meeting*, San Francisco, USA, 26-30 Nov 2007.
13. **B. Reeja-Jayan**, E. de la Rosa, S. Sepulveda-Guzman, R.A. Rodriguez, and M. J. Yacaman, "Oriented Attachment Driven Growth of Porous Single Crystalline ZnO Nanodisks with Sponge-like Morphology", *2<sup>nd</sup> International Meeting on Developments in Materials, Processing and Applications of Nanotechnology (MPA-2008)*, University of Cambridge, UK, 6-8 Jan 2008.

## Invited talks

1. "Far-from-Equilibrium Structures and Processes using Electromagnetic Fields", **Invited Seminar at Shinshu University**, Nagano, Japan, 8 September 2017.
2. "Engineering Ceramic, Polymer, and Hybrid Thin Film Nanomaterials and Interfaces", **Invited Seminar at Anton Para Inc.**, Graz, Austria, 8 August 2016.
3. "Molecular Scale Engineering of Materials for Structurally Integrated Energy Applications", **Invited Seminar at US Army Research Laboratory**, Aberdeen, Maryland, 9 June 2016.
4. "Molecular Scale Engineering of Hybrid Thin Film Materials for Energy Applications", **Invited Seminar at Royal Institute of Technology**, Stockholm, Sweden, 14 March 2016.
5. "Molecular Scale Engineering of Hybrid Thin Film Materials for Energy Applications", **Invited Seminar in Mechanics and Materials at Swiss Federal Institute of Technology in Zurich**, Switzerland, 10 March 2016.
6. "Molecular Scale Engineering of Hybrid Thin Film Materials for Energy Storage", **Invited Seminar at General Motors Battery Systems Group**, 26 Oct 2015.
7. "Engineering Thin Film Materials and Interfaces for Flexible, Miniaturized Energy Devices", **Indian Institute of Science (IISc)**, Chemical Engineering Seminar, 9 July 2015.
8. "Engineering Thin Film Materials and Interfaces for Flexible, Miniaturized Energy Devices", **Invited Seminar at Boston University**, ME and MSE Seminar Series, 25 Feb 2015.
9. "Engineering Thin Film Materials and Interfaces for Flexible, Miniaturized Energy Devices", **Invited Seminar at Carnegie Mellon University**, Mechanical Engineering Seminar Series, 12 Feb 2015.
10. "Engineering Thin Film Materials and Interfaces for Flexible, Miniaturized Energy Devices", **Invited Seminar at Columbia University**, Chemical Engineering Seminar, 3 Feb 2015.
11. "Engineering Thin Film Materials and Interfaces for Flexible, Miniaturized Energy Devices", **Invited Seminar at the North Carolina State University**, Chemical and Biomolecular Engineering Seminar Series, 23 Jan 2015.
12. "Engineering Thin Film Materials and Interfaces for Flexible, Miniaturized Energy Devices", **Invited Seminar at the Washington State University**, Mechanical and Materials Engineering Seminar Series, 30 Oct 2014.

13. "Engineering Hybrid Polymeric Interfaces for Energy Harnessing and Storage", **Invited Seminar at the University of Connecticut**, Nano Energy Seminar Series, 27 Jun 2014.
14. "Initiated Chemical Vapor Deposition of Electron and Ion Conducting Polymer Films", **Invited Speaker** at Fikile Brushett research group, Chemical Engineering, **Massachusetts Institute of Technology**, 10 Apr 2014.
15. "Addressing Fundamental and Technological Challenges in Organic-Inorganic Hybrid Solar Cells", **Invited Speaker** at Rene Janssen research group, Department of Chemistry and Physics, **Eindhoven University of Technology, Netherlands**, 21 Dec 2012.
16. "Effect of Interfacial Dipoles on Charge Traps in Organic-Inorganic Hybrid Solar Cells", Invited Speaker at the **UT-Austin ERFC Annual Retreat**, 15 Dec 2012.
17. "Organic-Inorganic Hybrid Solar Cells", Invited Speaker for Materials Science & Engineering Graduate Student Seminar Series, **UT-Austin**, 21 Oct 2011.
18. "Efficient, Stable Organic-Inorganic Hybrid Solar Cells", Invited Speaker, **American Association of University Women (AAUW)**, Austin (Texas) *Branch Meeting*, 8 May 2010.

## **RESEARCH FUNDING**

1. **ARMY RESEARCH OFFICE (ARO) - Young Investigator Program** (\$360,000)
2. **AIR FORCE OFFICE OF SCIENTIFIC RESEARCH (AFOSR) - Young Investigator Program** (\$360,000)
3. **DEPARTMENT OF ENERGY (DOE) - ELECTROCAT** (\$10,985)
4. **NATIONAL SCIENCE FOUNDATION (NSF) Division Civil, Mechanical and Manufacturing Innovation** (\$9,845)
5. **OFFICE OF NAVAL RESEARCH (ONR)** (\$9,400)
6. **BERKMAN FACULTY DEVELOPMENT Grant, Carnegie Mellon University** (\$3,000)
7. **WIMMER FACULTY FELLOWSHIP, Carnegie Mellon University** (\$3,000)
8. **STRUMINGER FACULTY FELLOWSHIP, Carnegie Mellon University** (\$15,000)
9. **INCUBATE Seed Grant, Carnegie Mellon University** (\$144,661)
10. **CIT INFRASTRUCTURE Grant, Carnegie Mellon University** (\$401,800)



## 11. COLLABORATIVE GRANT, Mechanical Engineering, Carnegie Mellon University (\$144,661)

### TEACHING EXPERIENCE

#### 1. CMU Spring 2017 (*Overall Teaching: 4.50/5; Overall Course: 4.00/5*) – 14 students Course 24-653: **Materials and Their Processing for Mechanical Engineers**

Designed and taught an graduate/upper undergraduate level course that introduces the major classes of materials (e.g., metals, alloys, ceramics, polymers, composites) and their structure-processing-property relationships to Mechanical Engineering students. This course teaches the fundamental concepts behind how the processing of materials influences their atomic/molecular structures and resulting properties. The course pioneers a game-based learning approach in which students will utilize the virtual **Minecraft** environment to study crystal structures, imperfections (defects), diffusion, and phase equilibria. These concepts are then applied to characterize and interpret the (mechanical, electrical, magnetic, and optical) properties of various material systems as part of a final project.

#### 2. CMU Fall 2015 (*Overall Teaching: 4.44/5; Overall Course: 4.27/5*) – 102 students

#### 3. CMU Fall 2016 (*Overall Teaching: 4.27/5; Overall Course: 4.00/5*) – 114 students

#### Course 24-452: **Mechanical Systems Experimentation**

Co-taught a senior level undergraduate course on developing experimental background and understanding on the dynamic behavior and control of mechanical systems. In addition, specific issues about mechanical systems experimentation, such as repeatability, linearity, design of experiments and uncertainty, will be discussed.

#### 4. **Research Mentor**, CMU 2015-present

- Serving as PhD for 4 graduate students (2 have successfully passed the Mechanical Engineering PhD qualifying exams. 1 student will take exam in Fall 2017). One PhD student was awarded **Nam Pyo and Young Suh Fellowship** in Mechanical Engineering and the **National Defense Science & Engineering Fellowship (NDSEG)**.
- Served as postdoctoral adviser for 1 student who has since joined private industry.
- Graduated 1 MS student in Materials Science and Engineering. Her thesis was titled: *Microwave radiation assisted synthesis of crystalline zinc oxide thin films*
- Supervising 10 undergraduate students, training them on various laboratory techniques, data analysis methods, critical thinking skills while providing direction and guidance on their research projects.
- 3 undergraduate students won both SURG and SURF awards
- Co-authored 3 journal articles with 2 of these students.

#### 5. **Research Mentor**, UT-Austin and MIT 2008-present

- Served as the research mentor for 5 graduate students, 2 pre-graduate school interns, and 3 undergraduate students, training them on various laboratory techniques, data analysis methods, critical thinking skills while providing direction and guidance on their research projects.

- Co-authored 4 journal articles with 3 of these students. Projects include hybrid polymer photovoltaics, microwave-assisted synthesis of crystalline thin films and nanoscale polymeric electrolytes for 3D batteries.

#### **6. Teaching Certificate Program, MIT**

Spring 2014

Completed workshop taught by the MIT Teaching and Learning Laboratory aimed at developing teaching skills for a career in academia. Topics included overview of research on how people learn, course and syllabus design, constructing effective problem sets, planning a class session, interactive teaching and active learning, teaching inclusively, and educational technologies.

#### **7. Guest Lecturer, MIT**

Spring 2014

Course: **Introduction to Chemical and Biological Thermodynamics**

- Developed and delivered two highly rated lectures on “Phase Equilibria” which included discussions on chemical potential, fugacity coefficient and the thermodynamics of mixtures
- Gave both lectures to a class of ~ 70 undergraduate students
- Successfully integrated active learning into the classroom using a variant of the “one-minute paper” exercise

#### **9. Guest Lecturer, UT-Austin**

Fall 2011

Course: **Materials Engineering**

- Developed and delivered two lectures on “Diffusion in Solids” which included discussions on thermodynamics and thermally activated processes in materials.
- Gave both lectures to a class of ~ 30 undergraduate students

#### **10. Graduate Teaching Assistant, UT-Austin**

Spring 2008

Courses: **Solar Conversion Devices, Solid State Electronics**

- Assisted in designing and teaching a new upper undergraduate/graduate level class consisting of ~ 20 students. Students were introduced to the fundamental solid-state physics, thermodynamics, and basic design principles of photovoltaic devices.
- Held multiple office hours and discussion sessions per week.
- Wrote quizzes, graded homework, and evaluated term projects

### **OTHER EXPERIENCE**

**Experimental Expertise:** Extensive experience working with solution/microwave synthesis, CVD and PVD synthesis, glovebox usage, and photovoltaic testing. Specific experimental characterization techniques include neutron and x-ray diffraction (powder and film), microscopy (SEM, high resolution TEM, AFM) and spectroscopy (XPS, EIS, FTIR, ICP-MS, Raman, UV-Vis spectroscopy, fluorescence spectroscopy, variable angle spectroscopic ellipsometry), pair distribution function (PDF) analysis. Working experience with various electrochemical test systems.

**Programming Languages:** MATLAB, Visual Basic, C, C++

### **PROFESSIONAL ACTIVITIES**

- Associate Technical Editor - MRS Bulletin 2012-2015
- Elected member of Users' Executive Committee (UEC) for photon sciences at

- Brookhaven National Laboratory (Department of Energy DOE) 2017-present
- NSF Panel Reviewer, Graduate Research Fellowship Program (GRFP) 2016
- NSF Panel Reviewer, Energy for Sustainability, Division of Chemical, Bioengineering, Environmental, and Transport Systems (CBET), Innovations at the Nexus of Food, Energy, Water Systems (INFEWS), Civil, Mechanical and Manufacturing Innovation (CMMI (MRI), CMMI-MEP (ad-hoc), Division of Materials Research (DMR) (ad-hoc), 2014-present
- Technical program committee member, technical reviewer, and session chair/co-chair, Topical Conference: Sensors program at the Annual Meeting of the American Institute of Chemical Engineers (AIChE) 2015-present
- Panelist (Fibers) - Greater Philadelphia Smart Fabrics Conference 2017
- Lead organizer - Workshop on Electromagnetic Effects in Materials Synthesis – sponsored by NSF, ONR, and several industry partners
- Advisory committee member, International Conference on Advances in Materials and Manufacturing Applications (IConAMMA-2016), Amrita Vishwa Vidyapeetham University, India. 2016
- Reviewer for the following journal publications:  
*Scientific Reports, Macromolecules, Solar Energy Materials and Solar Cells, Solid State Ionics, Thin Solid Films, Energy Harvesting and Systems, ACS Sustainable Chemistry & Engineering, Journal of Nanoparticle Research, Nanoscience and Nanotechnology Letters, International Journal of Physical Sciences, MRS Symposia proceedings, IEEE Recent Advances in Intelligent Computational Systems (RAICS)*
- Co-founder - MIT Think Tank (<http://thinktank.mit.edu/>) 2013-present  
*MIT Think Tank is an organization promoting inter-disciplinary problem solving*
- Postdoctoral advisory committee member – MIT Innovation Initiative 2013-present
- Science reporter, MRS Meeting Scene e-newsletters 2011  
*Reports emailed to over 16000 members worldwide*
- Special contributor - MRS Bulletin Aug. 2011
- Founding President - MRS Student Chapter at UT-Austin 2009-2010

## **PROFESSIONAL AFFILIATIONS**

- Materials Research Society (MRS)
- American Ceramics Society (ACerS)
- American Institute of Chemical Engineers (AIChE)

## **COMMUNITY SERVICE AND OUTREACH**

1. **Minercraft & Manufacturing (M&M) Workshop** 2017 - present  
*A day long camp during which a selected group of middle school children (aged 9-14) from Pittsburgh schools were taught materials science using the game Minecraft. Students learned concepts during the morning session and developed a Minecraft module in the afternoon to demonstrate/model these concepts.*
2. **Summer Engineering Experience for Girls (SEE)** 2016 - present  
*Lecture and activities as part of CMU Engineering's annual summer classes for female students from Pittsburgh schools.*

3. **Energy from Everyday Things (CMU Gelfand Center)** 2016 - present  
*Lecture and activities on using everyday objects (water, fruit juice) to generate energy offered as part of Gelfand Center's saturday series classes for K-9 students from Pittsburgh schools.*
4. **The SciBridge project (connecting African and US scientists)** Dec. 2014  
*Invited to give inaugural webinar on "Solar Energy" to undergraduate students studying Physics at Makerere University, Uganda*
5. **Lakeway Men's Breakfast Club, Lakeway, Texas** Mar. 2012  
*Gave 60 min presentation on "Solar Energy". One of only two graduate student invited to speak at a meeting since 1989*
6. **Texas Leadership Society (TLS) Luncheon, Austin, Texas** Apr. 2011  
*Gave interactive presentation on "Clean Energy" as part of a community fundraising event for the graduate school at UT-Austin*
7. **Engineers for a Sustainable World (ESW)** Apr. 2011  
*Spoke to undergraduate student members of ESW on "Clean Energy" at their general meeting.*
8. **Get Moving!: A Journey for Junior Girl Scouts** Sept. 2010  
*Presented an interactive session on the topic "Energy" at Redeemer Lutheran School, Austin, Texas, motivating students to pursue STEM disciplines.*
9. **UT LAMP invited lecture at the Thompson Conference Center** Oct. 2010  
*Gave 60 min presentation on "Solar Energy Harnessing" to the senior citizen members of LAMP (Learning Activities for Mature People): a program offered by The Osher Lifelong Learning Institute at UT-Austin.*