

# Prateek Verma

PhD. Qualifies for O1 & EB1.

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Seeking opportunities where I can leverage my industrial and academic experience to drive differentiation and innovation. I am a machine learning scientist with cross-functional expertise in chemicals, materials, health, and environment. My key strengths lie in visionary and complex problem solving for the domains listed above, leadership, and research advising.

## Education

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### Georgia Institute of Technology, 2011 – 2015

PhD, Materials Science and Engineering, GPA 4.0/4.0  
Thesis – Auxetic behavior in polymer/fiber network structures

### Indian Institute of Technology Roorkee, 2006 – 2011

BS and MS, Polymer Science and Technology, GPA 8.5/10.0  
Thesis – Nanomechanics of tissue engineering polymer blend scaffolds

## Experience

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### Manager, Data Science Core, University of Arkansas, 2023 – present

Arkansas Integrative Metabolic Research Center (AIMRC)

- Evaluation, fine-tuning, and prompt engineering of large (vision) language models (LLMs) using multimodal data
- Building machine learning algorithms focused on medical research
- Serving 50+ researchers with their data science and machine learning needs
- Managing high-performance computing and data-storage servers

### Postdoctoral Fellow, University of Arkansas, 2021 – 2023

Nayani, Nakarmi and Wu groups

- Built an end-to-end CNN ML pipeline for scientific images
- Built graph and generative algorithms for molecular discovery and finding functional groups on molecules and macromolecules
- **Applications:** predicting onset of diseases, sensors for bacteria and viruses, drug and molecular design, medical diagnosis

### Postdoctoral Fellow, Georgia Institute of Technology, 2018 – 2021

Shofner and Russo groups

- Developed multivariable deep neural network regression to split, interpolate, and predict total signal into constituents
- Developed CNN and regression algorithms for noise detection in signals
- **ML applications:** Extract pollution composition (expensive measurement) from total PM2.5 (inexpensive) data; noise detection in light scattering data
- Fabricated metamaterial composites using tensegrity/auxetic approaches
- Executive Director for OPALL (Open Polymer Active Learning Laboratory)

### Senior Coating Chemist, Kimoto Tech, 2016 – 2018

- Team leader for 5 R&D chemists
- Led scale-up and production of 15+ lab-to-market products
- Development of flexible & protective coatings, conductive coatings, and pressure sensitive adhesives

### PhD candidate, Georgia Institute of Technology, 2011 – 2015

Griffin and Shofner groups

- Synthesized intrinsically auxetic liquid crystal elastomers
- Developed protocols for accurately measuring Poisson's ratio
- Developed a new method to induce auxetic properties in nonwovens
- Modeled processing-structure-property relations for auxetic behavior in fiber networks

### Research Assistant (Master's), University of Akron, 2011

Karim group

- Developed a buckling-based metrology to determine strength of thin films

- Prepared and tested strength of polymer-blend films used in tissue engineering

### Summer Intern, University of Massachusetts Amherst, 2010

McCarthy group

- Synthesized uniformly sized silica nanoparticles for composite applications
- Created super-hydrophobic surfaces using silanes; synthesized cross-linked silicones

### Summer Intern, University of Minnesota, 2009

Barocas group

- Synthesized epoxy networks to study flow through kidney membranes
- Synthesized and characterized collagen gels for tissue engineering

## Skills

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**Machine Learning** – Large language models, Vision language models, Graph neural networks, Chemical informatics, ML pipelines, RESNET, Support vector machines, K-Means clustering, Convolutional neural networks, Image preprocessing, Logistic regression, Linear regression.

**Computer languages** – Python, JavaScript, MATLAB, PHP, SQL, C/C++.

**Computational** – BioPython, Django, RDKit, Pandas, Tensorflow & PyTorch, Numpy, Scikit, Matplotlib, LAMMPS, Amazon Web Services, MATLAB, MySQL.

**Chemistry** – Polyurethane synthesis, Thermal & UV curing, LC elastomer synthesis, Free radical polymerization, Silanes & silicones.

**Materials** – Liquid crystals, Polymer processing, Viscoelasticity, Auxetic materials, Metamaterials, Biopolymers, Nanotechnology, Characterization, Structure-property relationships, Thermal analysis.

**Industry** – Adhesives, Process development, Chemical mixing, Chemical formulations, Protective coatings, Scale-up operations, Thermal & UV curing.

**Interpersonal** – Diversity, equity and inclusion, Mentoring, Research advising, Leadership, Team building, Teaching, Illustration.

**Lab Techniques** – Isothermal titration calorimetry, Environmental testing, Electron microscopy, FTIR, Micro-CT, Viscometry, Atomic force microscopy, DSC, TGA, DMA, Mechanical testing.

## Publications

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In the list of 24 total, 18 are published or submitted and 13 are first-author papers. [Google Scholar link](#)

### Under review / submitted

- **P Verma**, E Adeogun, ES Greene, S Dridi, U Nakarmi, et al.; Machine-learning classification of heat-stress in organisms using CNNs; *ACS Sensors*; **2024**

### Submitting next

- **P Verma**, U Nakarmi, K Nayani; Transformer and CNN based machine learning approaches to ligand discovery for viral purification; *The Journal of Chemical Information and Modeling*; **2024**
- **P Verma**, U Nakarmi, K Nayani; A new deep-learning approach for drug-like molecular classification and regression; *Nature Communications*; **2024**
- **P Verma**, DN Ansari, TU Ansari; Deep learning algorithms for extraction of aerosol chemical composition from temporal variations of total PM mass; *Environmental Science and Technology*; **2024**

### Published

- **P Verma**, MH Van, X Wu; Beyond human vision: The role of large vision language models in microscope image analysis; *arXiv*; **2024**; (preprint) ([link](#))
- MH Van, **P Verma**, X Wu; On large visual language models for medical imaging analysis: an empirical study; *IEEE/ACM CHASE*; **2024** ([link](#))
- D Ansari, **P Verma**, T Ansari; Promise of machine learning techniques towards retrieving aerosol chemical composition from temporal variations of total PM mass concentrations; *Journal of Research in Atmospheric Science*; 5-1; **2023** ([link](#))
- CW Irvin, CC Satam, K Shial, **P Verma**, NB Arroyo, et al.; Tricomponent polymer aerogels containing cellulose nanocrystals and chitin nanofibers and their use in aerogel/hydrogel hybrids as fibrocartilage replacements; *Journal of Applied Polymer Science*; **2023** ([link](#))
- X Fang, H Sun, C Wu, ..., **P Verma**, et al.; Ag nanoparticle-thiolated chitosan composite coating reinforced by Ag-S covalent bonds with excellent electromagnetic interference shielding and Joule heating performances; *ACS Applied Materials & Interfaces* (*IF=10.4*); **2023** ([link](#))
- **P Verma**, KB Wagner, AC Griffin, ML Shofner; Reversibility of auxetic response in polyester fiber needle-punched nonwovens; *Physica Status Solidi B*; **2022** ([link](#))

- H Sun, X Fang, Z Fang, ..., **P Verma**, et al.; An ultra-sensitive and stretchable strain sensor based on micro-crack structure for motion monitoring; *Micro Nano (Nature) (IF=8.1)*; 8 (111); **2022** ([link](#)).
- **P Verma**, C Smith, AC Griffin, ML Shofner; Towards textile metamaterials: A pathway to auxeticity and tensegrity in a needle-punched nonwoven stiff felt; *Materials Advances (RSC) (IF=5.0)*; **2022** ([link](#)).
- Q Kang, X Fang, C Wu, **P Verma**, H Sun, et al.; Improvement mechanism of brittle-plastic transition and residual stress in scratching 4H-SiC implanted by hydrogen ions; *Ceramics International (IF=5.2)*; **2022** ([link](#)).
- **P Verma**, C Smith, AC Griffin, ML Shofner; Corrigendum: Wool nonwovens as candidates for commodity auxetic materials; *Engineering Research Express*; 4 029501; **2022** ([link](#)).
- Q Kang, X Fang, C Wu, **P Verma**, H Sun, et al.; Mechanical properties and indentation-induced phase transformation in 4H-SiC implanted by hydrogen ions; *Ceramics International (IF=5.2)*; **2022** ([link](#)).
- **P Verma**, C Smith, AC Griffin, ML Shofner; Wool nonwovens as candidates for commodity auxetic materials; *Engineering Research Express*; 2 (4); **2021** ([link](#)).
- **P Verma**, C He, AC Griffin; Implications for auxetic response in liquid crystalline polymers; *Physica Status Solidi B*; 2000261; **2020**; (appeared in Wiley's 'Hot Topics: Liquid Crystals') ([link](#)).
- N Jappar, **P Verma**, J Holmes; Development of functional films in roll-to-roll manufacturing; *RadTech*; **2018**; (conference paper) ([link](#)).
- **P Verma**, ML Shofner, A Lin, KB Wagner, AC Griffin; Induction of auxetic response in needle-punched nonwovens: Effects of temperature, pressure and time; *Physica Status Solidi B*; 253 (7); **2016** ([link](#)).
- **P Verma**, ML Shofner, A Lin, KB Wagner, AC Griffin; Inducing out-of-plane auxetic behavior in needle-punched nonwovens; *Physica Status Solidi B*; 252 (7); **2015** ([link](#)).
- **P Verma**, ML Shofner, AC Griffin; Deconstructing the auxetic behavior of paper; *Physica Status Solidi B*; 251 (2); **2013** ([link](#)).

### Preprint

- X Fang, Q Kang, X Wu, ..., **P Verma**, et al.; Atomistic analysis on implantation effects of hydrogen ions and copper ions into 4h-SiC; *SSRN*; **2024** ([link](#)).

### In progress

- E Adeogun, **P Verma**, D Iyer, S Srivastava, K Nayani; Formation of liquid crystalline coacervates via the complexation of chromonic mesogens and synthetic polymers; *PNAS*; **2024**
- K Copenhaver, S Pennell, S Jain, PS Russo, **P Verma**; Classic Ubbelöhde intrinsic viscosity laboratory exercise made simple and fast; *Journal of Chemical Education*; **2023**

### Presentations

Speakers are shown in bold.

- **P Verma**, MH Van, X Wu; Evaluation of large vision language models on scientific images; Washington DC (USA); **2024** ([link](#)).
- **P Verma**, E Adeogun, ES Greene, S Dridi, U Nakarmi, et al.; CNN based rapid sensing of heat-stress in organisms; Orlando (USA); **2023** ([link](#)).
- P Verma, AC Griffin, **ML Shofner**; Pathways to manufacturing mechanical metamaterials by examining auxeticity in nonwoven fiber networks; Atlanta (USA); **2023**; (*Invited talk*) ([link](#)).
- P Verma, **ML Shofner**, AC Griffin; Pathways to Commodity Mechanical Metamaterials – Auxeticity in Nonwoven Fiber Networks; College Station (USA); **2022**; (*Invited talk*) ([link](#)).
- P Verma, AC Griffin, **ML Shofner**; Nonwoven textile structures – commodity pathways to auxeticity; Chicago (USA); **2022** ([link](#)).
- **P Verma**, ML Shofner, AC Griffin; Constructing out-of-plane auxetic response in paper; Denver (USA); 65 (1); **2020** ([link](#)).
- **P Verma**; Career pathways for polymer science students: industry vs higher education; Roorkee (INDIA); **2020**; (*Invited talk*).
- P Verma, **ML Shofner**, AC Griffin; Auxetic behavior in fiber networks; San Diego (USA); 258; **2019**
- **PS Russo**, X Zhang, P Verma, P Balding, G Parkinson, et al.; OPALL: The open polymer active learning laboratory at Georgia Tech; Orlando (USA); 257; **2019**
- P Verma, C He, **AC Griffin**; X-ray scattering from LC polymers: Implications for auxetic response; Bedlewo (POLAND); **2019**
- **P Verma**, KB Wagner, A Lin, ML Shofner, AC Griffin; Auxetic behavior in paper and nonwovens; Oak Ridge (USA); **2019**
- **P Russo**, P Verma, X Zhang et. al.; Open polymer active learning laboratory; Oak Ridge (USA); **2019**; (*poster*)
- P Verma, ML Shofner, **AC Griffin**; Origin of thickness change in needle-punched nonwovens; Sheffield (USA); **2018**
- P Verma, **ML Shofner**, AC Griffin; Auxetic behavior of fiber networks: Paper and nonwoven fabrics; Lake Louise (CANADA); **2017** ([link](#)).
- P Verma, **ML Shofner**, AC Griffin; Reversibility of thickness change in nonwovens; Crete (GREECE); **2017**
- P Verma, ML Shofner, **AC Griffin**; Auxetic liquid crystalline polymers; Crete (GREECE); **2017**
- P Verma, ML Shofner, **AC Griffin**; Reversibility of thickness change in nonwovens; Poznan (POLAND); **2016**
- **P Verma**, ML Shofner, AC Griffin; Inducing out-of-plane auxetic behavior in needle-punched nonwovens; Poznan (POLAND); **2014**
- **P Verma**, ML Shofner, AC Griffin; Auxetic behavior in cellulose based fiber networks; New Orleans (USA); **2013**

- **H Yuan**, J Marszalek-Kempke, P Verma, A Karim; Elastic moduli of polymeric thin films of nanocomposites and blends via buckling on elastomeric substrates; Boston (USA); 57 (1); **2012** ([link](#))
- P Verma, **ML Shofner**, AC Griffin; Deconstructing the auxetic behavior of paper; Bolton (UK); **2012**

## Teaching experience

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- Guest lecturer for Introduction to CNNs at U Arkansas (CSCE 4013) in **2022**
- Guest lecturer for Thermal analysis of polymers at Georgia Tech (MSE 4476) in **2020**
- Guest lecturer for Mechanical properties of polymers at Georgia Tech (MSE 4476) in **2019**
- Guest instructor for DSC and TGA of polymers at Georgia Tech (MSE 4476 (lab)) in **2019**
- Guest instructor for Rheology of detergent at Georgia Tech (MSE 3225 (lab)) in **2019**
- Guest lecturer for Polymer rheology at Georgia Tech (MSE 3225) in **2019**
- Teaching Assistant for DSC and TGA of polymers at Georgia Tech (MSE 4476 (lab)) in **2015**
- Teaching Assistant for Step, chain-growth, and emulsion polymerization at Georgia Tech (MSE 4476 (lab)) in **2014**
- Teaching Assistant for Introduction to polymer/fiber enterprise at Georgia Tech (MSE 3720) in **2014**
- Teaching Assistant for Thermal analysis, processing and rheology of polymers at Georgia Tech (MSE 4022 (lab)) in **2014**
- Teaching Assistant for Step, chain-growth, and emulsion polymerization at Georgia Tech (MSE 4476 (lab)) in **2013**
- Teaching Assistant for Thermal analysis, processing and rheology of polymers at Georgia Tech (MSE 4022 (lab)) in **2013**
- Teaching Assistant for Introduction to materials science and engineering at Georgia Tech (MSE 1111) in **2012**

## Honors and awards

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1. Selected for National Institute of General Medical Sciences (NISBRE) Conference Merit Award, **U Arkansas**, 2024
2. Postdoctoral Fellowship (including USDA \$300,000 grant to PI for my work), **U Arkansas**, 2021 – 2023
3. 5 year GT MSE mentorship award, **Georgia Tech**, 2021
4. Invited talk & career counselling for polymer graduates and undergraduates, **IIT Roorkee**, 2020
5. Executive Director, OPALL (Open Polymer Active Learning Laboratory), **Georgia Tech**, 2019 – 2021
6. Hightower Fellow, OPALL (Open Polymer Active Learning Laboratory), **Georgia Tech**, 2019 – 2021
7. Postdoctoral Fellowship, from Renewable Bioresources Institute, **Georgia Tech**, 2018 – 2020
8. Chairman, Technical Conference, **Kimoto Tech**, 2017
9. Second prize, poster competition (auxetic conference), **Georgia Tech**, 2014
10. PhD Fellowship, from Institute of Paper Science and Technology, **Georgia Tech**, 2012 – 2015
11. Chairman, National Polymer Conference, Cognizance, **IIT Roorkee**, 2009
12. Merit-based scholarship with tuition waiver, **IIT Roorkee**, 2007 – 2011

## Research funding

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Contributed to the planning, writing, editing and/or review of the following research funding proposals.

1. Developing liquid crystal based rapid optical sensors for detecting airborne viruses with SARS-CoV-2 and alpha-coronaviruses, NSF PIPP, PI: K Nayani, 2021
2. Awarded, Imaging and quantification of mitochondrial dynamics in response to mechanical stress, AIMRC, PI: K Nayani, 2021
3. Development of liquid crystal based wearable sensors for detecting airborne coronaviruses, PEW Biomedical, PI: K Nayani, 2021
4. Purification and rapid assessment of filled adeno-associated viral vectors, MAST UCRC, PI: K Nayani, 2021
5. Awarded, Development of convolutional neural networks that connect molecular signatures to rapid optical readouts on the health of chickens, USDA NIFA, PI: K Nayani, 2020
6. Zero-angle depolarized scattering (ZADS) and data analytics to determine molecular weight distributions of conjugated polymers, DOE FOA, PI: PS Russo, 2020
7. Awarded, Open Polymer Active Learning Laboratory: enhancing Georgia Tech's polymer profile in the residential higher-educational institution of tomorrow, GT COE, PI: PS Russo, 2020

## Research advising

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Direct supervisor for members marked with an \* . Last name has been hidden for the sake of privacy online.

**Sydnee\***, Molecular discovery using machine learning, 2022 – present. Journey – Senior (University of Arkansas)

**Honglin**, Machine learning models for noise detection in light scattering data, 2021 – 2022. Journey – PhD candidate (Georgia Tech)

**Evan\***, Building custom convolutional neural networks, 2021 – 2021. Journey – Sophomore (University of Arkansas)

**Brandon**, Isothermal titration calorimetry, 2021 – 2022. Journey – Junior (University of Arkansas)

**Lauren\***, Nanocellulose dispersion and auxetic composites, 2019 – 2020. Journey – Freshman (Georgia Tech)

**Marilyn\***, Polyurethane and silicone auxetic composites, 2019 – 2020. Journey – Sophomore (Georgia Tech)  
**Casey\***, Auxetic behavior in wool and stiff-felt fabrics, 2018 – 2019. Journey – Senior > PhD candidate (Georgia Tech)  
**Daniel\***, Gloss and haze control in coatings, 2017 – 2018. Journey – Formulations Chemist (Kimoto Tech) > Development Chemist (Birla Carbon)  
**Carly\***, Color correcting coatings for electronic displays, 2017 – 2018. Journey – R&D Chemist (Kimoto Tech) >>> Data Scientist (Takeda Pharmaceuticals)  
**Joseph\***, Anti-glare and anti-sparkle coatings for touch screens, 2016 – 2018. Journey – R&D chemist (Kimoto Tech)  
**Thomas\***, Protective hardcoats with adhesive backings, 2016 – 2018. Journey – R&D Chemist (Kimoto Tech) > Formulation Scientist (Meggitt Aerospace)  
**Jennifer\***, Silicone pressure sensitive adhesives, 2016 – 2017. Journey – R&D Chemist (Kimoto Tech) >>> Associate Senior Scientist (Pharmaceutical Associates Inc)  
**Stephen\***, Antiglare, but also high-clarity, coatings, 2016 – 2018. Journey – R&D Chemist (Kimoto Tech)  
**Karla\***, Auxetic behavior in needle-punched nonwovens, 2013 – 2014. Journey – Sophomore > PhD candidate (Georgia Tech)  
**Tony\***, Measurement of auxetic responses, 2013 – 2014. Journey – Sophomore (Georgia Tech) > PhD candidate (MIT)  
**Emily**, Cellulose and PVA based nanocomposites, 2013 – 2015. Journey – Junior >>> Senior Engineer (Exponent)  
**CJ\***, Auxetic response of paper, 2012 – 2012. Journey – Sophomore (Georgia Tech) > Vice President (Electrical Cable Specialists)

## Mentorship

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Serving as a mentor for GT Mentor Jackets, GT MSE Industry Mentorship Program and IITR Alumni Mentorship Program. Last name has been hidden for the sake of privacy online.

### Bachelor's

**Jaejung** from 2021 – 2022. Journey – Sophomore (Georgia Tech)  
**Tanmay** from 2020 – 2021. Journey – Sophomore (IIT Roorkee)  
**Nadia** from 2019 – 2021. Journey – Junior (Georgia Tech) > PhD candidate (MIT)  
**Steven** from 2019 – 2021. Journey – Senior > Master's student (Georgia Tech)  
**Dillan** from 2018 – 2019. Journey – Senior (Georgia Tech) > Engineer (Universal Alloy)  
**Michael** from 2017 – 2018. Journey – Freshman (Georgia Tech) > Intern (Lockheed Martin Space)  
**Amanda** from 2017 – 2018. Journey – Senior (Georgia Tech) > QA Coordinator (ALPLA Group)  
**Ankit** from 2016 – 2017. Journey – Freshman (Georgia Tech) > PhD candidate (UC Los Angeles)  
**Sabrina** from 2016 – 2017. Journey – Sophomore (Georgia Tech) > Senior Quality Engineer (Mainstay Medical)

### Doctoral

**Jude** from 2022 – present. Journey – PhD candidate (U Arkansas)  
**Elizabeth** from 2021 – present. Journey – PhD candidate (U Arkansas)  
**Homa** from 2021 – present. Journey – PhD candidate (U Arkansas)  
**Krishna** from 2019 – 2020. Journey – PhD candidate (Georgia Tech)  
**Hongmo** from 2017 – 2018. Journey – PhD candidate (Georgia Tech)  
**Sahitya** from 2017 – 2018. Journey – PhD student (Georgia Tech) > Process Engineer (Intel Corporation)  
**Helen** from 2016 – 2017. Journey – PhD student (Georgia Tech) > Process Engineer (Intel Corporation)

### Master's

**Pragya** from 2021 – 2021. Journey – Master's student (IIT Roorkee)  
**Ada** from 2018 – 2021. Journey – Master's student (Georgia Tech) > Senior Research Associate (Tessera Therapeutics)

## Leadership

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Leadership roles in various organizations and clubs.

- DEI council representative for research scientists and postdocs in the department, Georgia Tech, **2019 – 2021**
- Co-launched, Postdoc Chats, series of social and professional development gatherings for postdocs campuswide, Georgia Tech, **2019 – present**
- Advisor, to graduate and undergraduate members and users, OPALL Polymer Makerspace, Georgia Tech, **2019 – 2022**
- Team Leader, for 5+ industry research scientists, Kimoto Tech, **2016 – 2018**
- Co-manager, Polymer Thermal Analysis Lab, Georgia Tech, **2013 – 2015**
- Student President (elected, Saharanpur Campus), IIT Roorkee, **2008 – 2009**
- Founder and Team Leader, intranet web development, IIT Roorkee, **2007 – 2010**

## Scientific reviewing

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Reviewed manuscripts for the following journals:

- Applied Sciences (MDPI)
- Computational Materials Science (Elsevier)
- Industrial & Engineering Chemistry Research (ACS)
- Journal of Engineered Fibers and Fabrics (Sage)
- Journal of Micromechanics and Microengineering (IOP)
- Journal of Rheology (AIP)
- Machines (MDPI)
- Materials Research Express (IOP)
- Physica Status Solidi (Wiley)
- Proceedings of the National Academy of Sciences (PNAS)
- Sensors (MDPI)
- Surface and Coatings Technology (Elsevier)

## References

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**Anselm C Griffin**, Professor Emeritus, Georgia Tech. Email: [anselm.griffin@mse.gatech.edu](mailto:anselm.griffin@mse.gatech.edu)

**Meisha L Shofner**, Associate Professor, Georgia Tech. Email: [meisha.shofner@mse.gatech.edu](mailto:meisha.shofner@mse.gatech.edu) ([Website](#))

**Paul S Russo**, Professor, Georgia Tech. Email: [paul.russo@mse.gatech.edu](mailto:paul.russo@mse.gatech.edu) ([Website](#))

**Bin Li**, Senior Research Chemist, Koppers. Email: [binli415@gmail.com](mailto:binli415@gmail.com)

**Karthik Nayani**, Assistant Professor, U Arkansas. Email: [knayani@uark.edu](mailto:knayani@uark.edu) ([Website](#))

**Ukash Nakarmi**, Assistant Professor, U Arkansas. Email: [unakarmi@uark.edu](mailto:unakarmi@uark.edu) ([Website](#))