Rohan Shorey

Sustainable Materials Scientist

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Professional Overview

An award-winning polymer scientist with a PhD from the University of Waterloo, specializing in sustainable materials science. My research has a proven track record of developing sustainable biopolymers with high-impact publications and over 360 citations. I am a passionate, forward-thinking researcher eager to apply my expertise in Environmental Intelligence and Materials Science to address local and global challenges in Vietnam.

Work Experience

Postdoctoral Researcher
Corteva, Inc., United States and University of Waterloo | 2024 – 2025

- **Material Research & Development:** Developed and optimized sustainable bio-based superabsorbent polymers (SAPs) for seed coating applications. Engineered biopolymer coating formulations to enhance moisture gain by up to 2100%.
- **Lab Safety & Equipment Management:** Developed safety procedures, design and maintain advanced lab equipment, and oversee material procurement and inventory management.
- **Performance Evaluation & Data Analysis:** Tested coating properties and germination performance under stress conditions. Analyzed high-throughput germination data to assess the effectiveness of SAPs in mitigating water stress.
- **Training & Mentorship:** Guided students and researchers in using specialized lab equipment and techniques, while aiding developing Ph.D. candidates on conceptualizing their research projects.

Technical Consultant (Sales)
Risun Polymer (Canada) Co., Ltd, Hamilton | 2023 - 2024

- **Scientific and Technical Advising:** Provided expert scientific guidance to resolve complex client challenges, bridging the gap between scientific principles and real-world applications.
- **Interdisciplinary Communication:** Leveraged strong cross-functional communication to build client relationships and present technical information clearly to diverse audiences at international conferences and expos.

Graduate Researcher and Chemical Waste Manager
University of Waterloo, Waterloo | 2019 – 2023

- **High-Impact Research:** Spearheaded five research projects on lignin valorization, resulting in seven publications in peer-reviewed journals. Designed, synthesized, and scaled-up functionalized polymers from biomass sources.
- **Mentorship & Project Management:** Collaborated with and mentored a team of over eight junior researchers. Planned, managed, and optimized research projects from hypothesis validation to final product development, overcoming research obstacles proficiently.
- **Safety & Compliance:** Engineered and managed a hazardous chemical waste system in accordance with stringent regulatory standards (OSHA).
- **Leadership & Service:** Headed waste minimization efforts and maintained meticulous records to ensure regulatory compliance, demonstrating a commitment to service to the university and profession.

Education

Post-doc in Chemical Engineering
University of Waterloo
2025

Ph.D. in Chemical Engineering
University of Waterloo
2023

B.Tech. in Chemical Engineering
University of Petroleum & Energy Studies
2018

Skills

- Polymer Chemistry
- Bioplastic Processing
- Environmental Intelligence
- Composite Materials
- 3D Printing and Prototyping
- Curriculum Development
- Academic Advising & Mentorship
- Project Leadership
- Data and Statistical Analysis
- High-Impact Research
- Patent Drafting
- Interdisciplinary Collaboration
- Professional Communication

Awards

IPR Award for Academic Excellence in Polymer Science/Engineering – 2021

Graduate Research Studentship (GRS) Scholarship of $74.8k **–** 2020

International Doctoral Student Award Scholarship of $45.8k – 2020

Teaching Experience

Capstone Design Mentor
University of Waterloo, Waterloo

- Successfully aided in mentoring undergraduate students in their final (capstone) design project by training of lab equipment (processing and characterizations) as well as instructing on data analysis.
    - PlastAway Pods: Improved Biodegradable and Water-Soluble Films for Detergent Pods – **Walmart Award winner.**
      Students: Robert Duff, Shunam Ghosh, Ansh Gupta, Sameen Khan.

Graduate Teaching Assistant, Department of Chemical engineering
University of Waterloo, Waterloo | 2021 - 2023

- **Teaching & Student Mentorship:** Tutored, mentored, and evaluated the performance of over 250 students. Oversaw laboratory sessions, providing direct instruction on complex equipment such as Bioreactors, Fluidized Bed Reactors, and Melt Extruders.
- **Curriculum Development & Academic Advising:** Provided academic advising to students and contributed to the development of course materials. Assisted in developing and evaluating student performance in accordance with predefined rubrics.
- **Leadership & Technical Training:** Managed student teams and provided hands-on training for key technical proficiencies, including advanced data analysis in Python and Excel. Fostered a collaborative learning environment and helped students successfully complete their coursework.

Publications and Patents

I. Articles Published in Peer-Reviewed Journals

1. **Shorey R**, Ataeian P, Mekonnen TH. Effect of acetylation of kraft lignin on the blend compatibility with cellulose acetate and the resulting physicomechanical properties. Cellulose 2024:1–16. https://doi.org/10.1007/s10570-024-06073-7.
2. **Shorey R**, Mekonnen TH. Oleic acid decorated kraft lignin as a hydrophobic and functional filler of cellulose acetate films. Int J Biol Macromol 2024;268:131672. https://doi.org/10.1016/J.IJBIOMAC.2024.131672.
3. **Shorey R**, Salaghi A, Fatehi P, Mekonnen TH. Valorization of lignin for advanced material applications: a review. RSC Sustainability 2024;2:804–31. https://doi.org/10.1039/D3SU00401E.
4. Tadele DT, **Shorey R**, Mekonnen TH. Fatty acid modified zein films: Effect of fatty acid chain length on the processability and thermomechanical properties of modified zein films. Ind Crops Prod 2023;192:116028. https://doi.org/10.1016/J.INDCROP.2022.116028.
5. **Shorey R**, Mekonnen TH. Esterification of lignin with long chain fatty acids for the stabilization of oil-in-water Pickering emulsions. Int J Biol Macromol 2023;230:123143. https://doi.org/10.1016/j.ijbiomac.2023.123143.
6. **Shorey R**, Mekonnen TH. Sustainable paper coating with enhanced barrier properties based on esterified lignin and PBAT blend. Int J Biol Macromol 2022;209:472–84. https://doi.org/10.1016/J.IJBIOMAC.2022.04.037.
7. **Shorey R**, Gupta A, Mekonnen TH. Hydrophobic modification of lignin for rubber composites. Ind Crops Prod 2021;174:114189. https://doi.org/10.1016/J.INDCROP.2021.114189.

II. Manuscripts Submitted & Under Review

1. **Shorey R**, Esmizadeh E, Mekonnen TH. Progress in bioplastics blends, compatibilization, modifications, and AI-driven Innovations for material applications. Progress in Polymer Science 2025. Manuscript Number: PPS-D-25-00136.
2. Islam MS, **Shorey R**, Sproule D, Esmizadeh E, Leung K, Gupta A, Mekonnen TH. Polysaccharide-based superabsorbent hydrogels (SAH) as sustainable material alternatives for personal hygiene products. Int J Biol Macromol 2025. Manuscript Number: IJBIOMAC-D-25-15673.

III. Manuscripts in Preparation

1. Nguyen PK, **Shorey R,** Mekonnen TH. Enhanced Thermomechanical and Crystallization Kinetics of Polyhydroxyalkanoate Blends for Advanced Manufacturing and Biomedical Devices.
2. **Shorey R**, Tiruneh TT, Mekonnen TH. Sustainable Waterborne Dispersion Systems for Functional Paper Coating Applications Using Biodegradable Polymeric Phases.
3. **Shorey R**, Islam MS, Mekonnen TH. Synthesis of Carboxymethyl Starch Superabsorbent Hydrogels (SAHs) for Moisture Management and Controlled Delivery of Agrochemicals in Triticum aestivum Seed.

IV. Intellectual Property / Patents

1. Eco-Compatible Aqueous Barrier Coatings Derived from Biodegradable Polymers for Sustainable Cellulosic Substrate based Packaging Solutions.
   Status: In draft
   Inventors: Mekonnen TH, **Shorey R**.

Conference Proceedings

1. Canadian Society for Chemical Engineering Conference (CSChE 2025), Montreal – Development of Lignin-Based Biocomposites for Sustainable Material Solutions.
2. Americas Regional Meeting of the Polymer Processing Society (PPS 2025), Guelph – Polysaccharide-based Hydrogels for Controlled Urea Release: A Sustainable Alternative to Conventional Fertilizers.
3. 45th Annual Symposium on Polymer Science/Engineering, Institute for Polymer Research, Waterloo – Unlocking the potential of lignin for functional and sustainable material solutions (**Keynote Presenter**).

Independent Project

Carbon Compass: Navigate your Footprint (AI powered personal carbon footprint calculator**)**

- Designed and built a conversational Gemini-powered chatbot to quantify and reduce individual carbon footprints.
- Calculates real-time annual CO_2 emissions from transport, flights, home energy use, and diet.
- Provides personalized, actionable reduction tips on each interaction using a custom RAG pipeline.
- Integrated Gemini's structured output (JSON Mode), embeddings (vector store), and real-time similarity search for dynamic tip generation.
- Implemented an intelligent agent class in Python using Gemini API, Sentence Transformers, and cosine similarity for relevance ranking.
- Deployed a functional proof-of-concept chatbot to engage users with memorable, accessible sustainability guidance.
- **Technologies:** Google Generative AI, Python, Sentence Transformers, scikit-learn, JSON, Kaggle secrets management.

Certifications

- Google AI Essentials by **Google** (2025).
- Google's Gen AI intensive course by **Google** & **Kaggle** (2025).
- Health, Safety, & Environment (HSE) Certificate in Process Safety Management (PSM) by **NEBOSH, UK** (2019).
- Diplôme d'études en langue française (Levels: B1, A2, and A1) by **French Ministry for National Education, France** (2019).

Referees

1. Prof. Tizazu Mekonnen
   Ph.D. supervisor/mentor
   tizazu.mekonnen@uwaterloo.ca

2. Prof. Alexander Penlidis
   Doctoral defense committee member/mentor
   penlidis@uwaterloo.ca

3. Mr. John Zhang
   GTA supervisor - multiple terms
   m78zhang@uwaterloo.ca