

ESHANI HETTIARACHCHI, Ph.D.

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SCIENTIST

PROBLEM SOLVING | ANALYTICAL INSTRUMENTATION | EFFECTIVE COMMUNICATION

A productive, goal-oriented scientist who is highly skilled at applying scientific principles to different technical projects. Effective oral and written communication skills proven through first-authored peer-reviewed articles, invited speaker at scientific conferences and a frequent presenter at public science-outreach events.

EDUCATION

Ph.D. in Chemistry – 2020

With a focus on Atmospheric & Environmental Chemistry at New Mexico Institute of Mining and Technology (New Mexico Tech), USA | Ph.D. Advisor: Dr. Gayan Rubasinghege

“Dissertation Title: Study of Heterogeneous Chemistry & Photochemistry of Atmospheric Aerosols: Impact of Mineralogy on Ocean Fertilization, Human Health and the Greenhouse Gas Mitigation”

B.Sc. Special Degree in Chemistry – 2015

With minors in Geology and Molecular Biology & Biochemistry at University of Peradeniya, Sri Lanka

“Research Project: Development of Activated Coconut Coir for Water Desalination and Treating Water Hardness”

BTECH in Computer Science (Sp. Multimedia & Graphics Designing) – 2012

Joint Diploma from IDM Affiliated University College, Kuliapitiya, Sri Lanka, and Edexcel UK, UK

TECHNICAL SKILLS

Spectroscopic and Chromatographic Techniques: Fourier Transform IR Spectroscopy (FTIR - ATR, Transmission), High Resolution Mass Spectrometry (HRMS), Gas Chromatography Mass Spectrometry (GCMS), UV-VIS Spectroscopy, Ultra-High Performance Liquid Chromatography (UPLC), Florescence Spectroscopy (FS), Inductively Coupled Plasma – Mass Spectrometry (ICP-MS), NMR Spectroscopy, Atomic Absorption Spectroscopy (AAS)

Microscopic Techniques: Scanning Electron Microscopy with Energy Dispersive X-Ray Analysis (SEM-EDX), Transmission Electron Microscopy (TEM), Light Microscopy (LM)

Other Technical Skills: Cyclic Voltammetry (CV), Vibrating Sample Magnetometry (VSM), Thermogravimetric Analysis (TGA), X-Ray Diffraction Analysis (XRD), Total Organic Carbon Analyzer (TOC), Surface Area Analyzer (BET-SAA), Vacuum Systems and Solar Simulators, Inorganic Synthesis and Characterization

Programming Languages: Matlab, Python, ShareLaTeX

Selected Software Packages: MiniTab, Avogadro, PHREEQC, Geochemist’s Workbench, Spartan, ImageJ, Origin, Kgraph, Essential FTIR, ProcessEye, SpectraMagic NX, Diamond, QGIS, Adobe Package, Inkscape, ProCreate, and MS Office

SCIENTIFIC SKILLS

- Strong theoretical and practical knowledge of surface and environmental chemistry including laboratory techniques as demonstrated through 15+ peer-reviewed research articles, with more than 10 first-authored, and 3 science-magazine articles. [Google Scholar: scholar.google.com/citations?user=Oef40NQAAAAJ&hl=en&oi=ao](https://scholar.google.com/citations?user=Oef40NQAAAAJ&hl=en&oi=ao).
- Presenter at 11 scientific conferences, often as an oral or featured speaker.
- Heterogeneous atmospheric chemistry processes, and gas-surface and liquid-surface interactions, including reaction kinetics and sorption phenomena.
- Chemical kinetics, dynamics, and structural and conformational analysis of organic and inorganic compounds in trace and bulk matrices.
- Elucidation of chemical/biological system interactions and feedback mechanisms.

- Synthesis and characterization of nanomaterials and metal organic frameworks.
- Interdisciplinary scientific team leadership and study coordination.
- Laboratory experiment design and execution, laboratory management and operations, data management.
- Mentorship and teaching of students and new scientists.
- Journal review board member for MDPI and a reviewer for ACS and Elsevier.

EMPLOYMENT EXPERIENCE

Postdoctoral Scholar, Department of Chemistry & Biochemistry, University of California San Diego (Grassian Research Group, Prof. Vicki H. Grassian) – 2020 – present

1. Studies chemical interactions between atmospheric pollutant gases (volatile organic compounds and traces inorganic gases) and solid surfaces (minerals and metals) to understand how different classes of pollutants influence air quality and radiative forcing.
2. Uses high purity vacuum systems and optical (**FTIR**) and mass spectroscopic (**HRMS**) techniques to measure complex and difficult to resolve interactions of reactive air pollutant gases with solid surfaces at a molecular level.
3. Writes peer-reviewed publications of new findings. (*ref. 1,2 & 4*)
4. Area Safety Coordinator (ASC) for the laboratory: Conduct UCSD mandated safety trainings for new laboratory personnel, keep track of current laboratory personnel required safety trainings, schedule and conduct safety audits, waste and chemical inventory management, and working with Environment, Health & Safety (EH&S) department for continued research safety.
5. Mentors students, creates protocols, standard operation procedures, and documentation for training and new student/postdoc orientations and recruitment to increase the effective integration of new lab members.
6. Laboratory management: Organized planned-purchasing to reduce operational costs. Achieved a UCSD-Green Lab Program Gold certificate, an upgrade from the previously held Green certificate with my team to reduce our environmental footprint while sustaining scientific effectiveness. Coordinated team meetings and laboratory functions to optimize time and equipment use.
7. Marketing and Communication Co-Vice Chair for UC San Diego Postdoctoral Association (PDA). I maintain PDA website, social media channels, and other marketing for PDA, maintaining the vibrancy and visibility of the PDA professional network.
8. Served as a hiring committee member for UCSD EH&S, for EH&S specialist position, providing my expertise as an experimental chemist who understand what to expect from an EH&S specialist.

Graduate Teaching Assistant and Research Assistant (for Ph.D. Dissertation); New Mexico Tech – 2016 – 2020

1. Designed experiments and conducted research with numerous analytical and spectroscopic (**XRD, FTIR, ICP-MS, FS**), microscopic (**SEM, TEM**) and computational techniques (**PHREEQC**) to determine the characteristics of uranium containing dusts collected in the field from mining operations near areas of increased cardiovascular disease incidence. (*ref. 5 & 11*)
2. Conducted research with **Surface Area Analyzer (BET-SAA)** and **Python** programming to determine the selectivity of Metal Organic Frameworks (MOF) for their selectivity toward CO₂ trapping, to mitigate the impact of greenhouse gas emissions. (*ref. 8 & 12*)
3. Developed research projects, designed and conducted research on mineral dusts and ocean algae & diatoms using numerous spectroscopic (**FTIR, ICP-MS, UV-VIS**), microscopic (**SEM, TEM, LM**) and other analytical and characterization techniques (**XRD, SAA**) to understand the mechanistic level impacts of iron on algae growth, an important phenomenon in ocean primary productivity, carbon sequestration, and climate science. (*ref. 7, 9, 10, 13, 14, & 17*)
4. Synthesized and characterized inorganic materials using **CV, VSM, TGA, XRD, TEM, and SAA** at Sandia National Laboratory, New Mexico to understand molecular level mineral specific mechanisms of ocean algae growth (*c. meneghiniana*) to include and improve current climate prediction models. (*ref. 7 & 17*)
5. Secured **student travel funding** via numerous resources including National Institute of Health to support my research and attend and present at leading scientific conferences in the field.
6. Information Officer of Graduate Students Association (GSA) at NMT, where I was in-charge of managing the website and marketing for GSA.

- Mentored junior students joining the research laboratory ensuring their efficient integration.
- Taught undergraduate chemistry laboratory and discussion classes.

Temporary Academic Staff (Teaching Assistant); Dept. of Chemistry, University of Peradeniya, Sri Lanka – 2015

- Conducted research to develop cost effective water desalination material to mitigate water pollution affected by Tsunami disaster in 2004, using coconut coir widely available in Sri Lanka. (*ref. 15 & 16*)
- Characterized water pollutant uptake on coir material using XRD, UV/VIS, FTIR, AAS, and SEM to assess filter capacity and regenerative processes.
- Organized, coordinated, and taught undergraduate laboratories for chemistry-majors.
- Organized and coordinated chemistry outreach events catered for high schoolers.

Intern Chemist; Hemas Manufacturing, Sri Lanka – 2014

- Developed a new and effective detergent powder formula with reduced cost within three weeks of time.

Freelancing (Slide Designing & Information Search) at fiverr.com – 2014/2015

- Worked as a Graphics and PowerPoint Slides Designer and Science Illustrator (Adobe Photoshop, Illustrator and MS-Office).

PEER-REVIEWED ARTICLES

Link to Google Scholar: <https://scholar.google.com/citations?user=OEf40NQAAAAJ&hl=en&oi=ao>

- Hettiarachchi, E.;** Grassian, V.H., Heterogeneous Chemistry of Methyl Ethyl Ketone on Mineral Oxide Surfaces: Impacts of Relative Humidity and Nitrogen Dioxide on Product Formation, *RSC ES: Atmospheres*, **2023**. <https://pubs.rsc.org/en/content/articlehtml/2023/ea/d3ea00023k>
- Hettiarachchi, E.,** Grassian, V.H., Heterogeneous Formation of Organonitrates (ON) and Nitroxy-organosulfates (NOS) from Adsorbed Alpha-Pinene derived Organosulfates (OS) on Mineral Surfaces, *ACS Earth & Sp. Chem.* **2022**. <https://pubs.acs.org/doi/10.1021/acsearthspacechem.2c00259>
- Sit, I; Quirk, E.; **Hettiarachchi, E.;** Grassian, V.H., Differential Surface Interactions and Surface Templating of Nucleotides (dGMP, dCMP, dAMP and dTMP) on Oxide Particle Surfaces, *ACS Langmuir*, **2022**. <https://pubs.acs.org/doi/10.1021/acs.langmuir.2c01604>
- Hettiarachchi, E.;** Grassian, V.H. Heterogeneous Reactions of Alpha-Pinene on Mineral Surfaces: Formation of Organonitrates and Oxidation Products, *J. phy. Chem. A* **2022**. <https://doi.org/10.1021/acs.jpca.2c02663>
- Hettiarachchi, E.;** Das, M.; Cadol, D.; Frey, B. Rubasinghege, G. The Fate of Inhaled Uranium-containing Particles upon Clearance to Gastro-Intestinal Tract, *RSC Environ. Sci.: Processes Impact* **2022**. <http://doi.org/10.1039/D2EM00209D>
- Rose, A.N.; **Hettiarachchi, E.;** Grassian, V.H.; Monoethanolamine Adsorption on Oxide Surfaces. *J. Colloid Interface Sci.* **2022**. <http://doi.org/10.1016/j.jcis.2022.01.059>
- Hettiarachchi, E.;** Ivanov, S.; Kieft, T.; Goldstein, H. L.; Moskowitz, B. M.; Reynolds, R. L.; Rubasinghege, G. Atmospheric Processing of Iron-Bearing Mineral Dust Aerosol and Its Effect on Growth of a Marine Diatom, *Cyclotella meneghiniana*. *Environ. Sci. Technol.* **2021**. <https://doi.org/10.1021/acs.est.0c06995>
- Thapa, S.; Meng, L.; **Hettiarachchi, E.;** Bader, Y. K.; Dickie, D. A.; Rubasinghege, G.; Ivanov, S. A.; Vreeland, E. C.; Qin, Y. Charge-Separated and Lewis Paired Metal-Organic Framework for Anion Exchange and CO₂ Chemical Fixation. *Chem. - A Eur. J.* **2020**. <https://doi.org/10.1002/chem.202002823>
- Hettiarachchi, E.;** Rubasinghege, G. Mechanistic Study on Iron Solubility in Atmospheric Mineral Dust Aerosol: Roles of Titanium, Dissolved Oxygen, and Solar Flux in Solutions Containing Different Acid Anions. *ACS Earth Sp. Chem.* **2020**. <https://doi.org/10.1021/acsearthspacechem.9b00280>

10. **Hettiarachchi, E.;** Reynolds, R. L.; Goldstein, H. L.; Moskowitz, B.; Rubasinghege, G. Bioavailable iron production in airborne mineral dust: Controls by chemical composition and solar flux *Atmos. Environ.* **2019**. <http://doi.org/10.1016/j.atmosenv.2019.02.037>
11. **Hettiarachchi, E.;** Paul, S.; Cadol, D.; Frey, B.; Rubasinghege, G. Mineralogy Controlled Dissolution of Uranium from Airborne Dust in Simulated Lung Fluids (SLFs) and Possible Health Implications. *Environ. Sci. Technol. Lett.* **2018**. <https://doi.org/10.1021/acs.estlett.8b00557>
12. Thapa, S.; **Hettiarachchi, E.;** Dickie, D. A.; Rubasinghege, G.; Qin, Y.; Li, R. A Charge-Separated Diamondoid Metal-Organic Framework. *Chemcomm. Communication.* **2018**. <https://doi.org/10.1039/c8cc07098a>
13. **Hettiarachchi, E.;** Reynolds, R. L.; Goldstein, H. L.; Moskowitz, B.; Rubasinghege, G. Iron Dissolution and Speciation in Atmospheric Mineral Dust: Metal-Metal Synergistic and Antagonistic Effects. *Atmos. Environ.* **2018**. <http://doi.org/10.1016/j.atmosenv.2018.06.010>
14. **Hettiarachchi, E.;** Hurab, O.; Rubasinghege, G. Atmospheric Processing and Iron Mobilization of Ilmenite: Iron-Containing Ternary Oxide in Mineral Dust Aerosol. *J. phy. Chem. A* **2018**. <http://doi.org/10.1021/acs.jpca.7b11320>
15. **Hettiarachchi, E.;** Kottegoda, N.; Chandani Perera, A. Activated Coconut Coir for Removal of Water Hardness. *Desalin. Water Treat.* **2017**. <http://doi.org/10.5004/dwt.2016.0339>
16. **Hettiarachchi, E.;** Perera, R.; Chandani Perera, A. D. L.; Kottegoda, N. Activated Coconut Coir for Removal of Sodium and Magnesium Ions from Saline Water. *Desalin. Water Treat.* **2016**. <http://doi.org/10.1080/19443994.2015.1129649>
17. **Hettiarachchi, E.;** Das, M.; Ivanov, S.; Rubasinghege, G. Novel Method Development for Synthesis of Nano-Ilmenite. – *ACS Inorg. Chem.* **2022**. *In preparation*
18. Kieft, T.L.; Del Curto, D.; Havlena, Z.; **Hettiarachchi, E.;** Lakis, I.; Nourse, E.; Skaar, C.; Ulbrich, J.; Veni, G., Potential for Mitigation of Cave Lampenflora Using Benzalkonium Chloride or UV-C. *Geoheritage*, **2023**. – **Under peer-review**

AWARDS AND HONORS

Link to Full Awards List: <https://eshani.wixsite.com/eshaniphd/awards>

ACS Recognition of Excellence in Leadership in Diversity, Equity, Inclusion, and Respect 2022 – *for volunteering at English in Action Program at UCSD dedicated toward helping incoming international students to improve their English language skills.* – **2022**

The NMT Founders Award – *“A Founders’ Award, the highest graduate honor was created to honor the persons responsible for establishing the New Mexico School of Mines in Socorro in 1889, especially J. J. Baca and Ethan Eaton. The award is presented to the recipient of an advanced degree who has made an outstanding contribution to Tech through scholarship, research, and involvement in campus affairs.”* – **2020**

Award for Graduate Research Excellence, Dept. of Chemistry, New Mexico Tech – **2020**

A Featured Student Researcher of NMT Graduate School Program 2020 – **2020**

The Langmuir Award – *“The Langmuir Award for Excellence in Research is given for an outstanding scientific research paper by any student or graduate of New Mexico Tech. The award is named in honor of Irving Langmuir (Nobel Laureate, 1932) who conducted extensive research with Tech staff”.* – **2019**

Outstanding Graduate Teaching Assistant Award, Dept. of Chemistry, New Mexico Tech – **2017**

VOLUNTEER HIGHLIGHTS

While at UCSD:

- Co-Organize and co-lead Bookworms at UCSD, a book club for UCSD affiliates (2022 – present).
- Tabletop science game designer of UCSD game designing group (2021 – present).
- Moderator for the SRC (Summer Research Conference at UCSD) in 2020 & 2021.
- An academic judge for ACS-SA Undergraduate Research Symposium 2021, UC LEADS Research Symposium, 2022 environmental chemistry judge for Eastern US Younger Chemist Committee Virtual Research Symposium, 2021.
- Volunteer at SCOPE (Scripps Community Outreach for Public Education) science outreach program.
- Environmental Science group coordinator and website maintainer for US-Sri Lanka academic and research collaboration network, the largest body of US-based scholars of Sri Lankan diaspora, aiming to strengthen US-Sri Lanka scholastic relationships (2021 – present).
- Volunteered for the Website Task Force of AAUW (American Association for University Women) Socorro chapter (Content Editor) – (2020 – 2022).

While at New Mexico Tech (NMT):

- Volunteered at AAUW Tech Trek in 2018 & 2019, ACS chemistry week events at NMT, chemistry outreach activities, NM science fiesta, as a judge for NM science fair, event supervisor for NM science Olympiad, discussion leader at ACS – Fall Meeting 2019 graduate school experience workshop, and at community events organized by Keep New Mexico True.
- Volunteered as a travel grants reviewer for GSA Travel Grants from 2016 – 2019 and other GSA sponsored events (Annual Thanksgiving Dinner, Graduate Student Symposium, 49ers Float, BBQ events).
- Through caving club, have helped BLM (Bureau of Land Management) in surveying new caves, restoration of caves, and cave trail markings within New Mexico.
- Actively involved in New Mexico Tech International Office & Auxiliary Services Office organized COVID-19 relief programs such as food drives, fundraisers, and relocating on-campus dormitory students to apartments, working with graduate collage as a student tester for various needs that arose due to the COVID-19 closures, and involved in Socorro, NM community COVID-19 relief programs that supported the most affected Socorro families from the COVID-19 pandemic.

LETTERS OF RECOMMENDATION AVAILABLE UPON REQUEST

Last updated: April 5th, 2023