

Jeewan C. Ranasinghe

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EDUCATION

Ph.D.	Louisiana State University, Baton Rouge, LA, USA Subject Area: Chemistry Thesis Title: Ultrafast and real-time dynamics of nanomaterials studied by advanced spectroscopic techniques Advisor: Louis Haber, Ph.D.	2019
B.Sc.	University of Peradeniya, Peradeniya, Sri Lanka Major: Chemistry Minor: Physics, Statistics	2010

RESEARCH INTERESTS

Bio-optical imaging, two-dimensional materials, biosensing, Raman spectroscopy, plasmonic nanomaterials, ultrafast spectroscopy, in-situ characterization, biophotonics optical sensing, nanoscale engineering, optical system development and implementation

RESEARCH EXPERIENCE

Postdoctoral Associate , Rice University, Houston, TX Advisor: Shengxi Huang, Ph.D. Project: Multiplexed and selective molecular sensing based on Raman enhancement platforms. <ul style="list-style-type: none">Designed, developed, and implemented an innovative approach for rapid biomarker screening of Alzheimer's disease by graphene assisted Raman spectroscopy and interpretable machine learning.Developed a methodology for molecularly defined and spatially resolved atlas of whole brain of animal models using Raman spectroscopy and machine learning.Developed a methodology for mapping tumor heterogeneity and metabolomics of pancreatic ductal adenocarcinoma (PDAC) Using Raman hyperspectral imaging with machine learning interpretation.Development of novel molecular sensing strategies that exploit Raman enhancement through two-dimensional materials	2022-now
Postdoctoral Scholar , Pennsylvania State University, University Park, PA Advisor: Shengxi Huang, Ph.D. Project: Understanding virus evolution through Raman spectroscopy. <ul style="list-style-type: none">Studied and reported the fundamental properties related to the optical identification of receptor-binding domain (RBD) of SARS CoV-2 spike protein, a key component of viral infection.Engineered two-dimensional materials for noise engineering of Surface-enhanced Raman spectroscopy substrates for RBD detection.Developed of novel sensing mechanisms to achieve high-sensitivity, high-specificity, and high-multiplexity sensing platforms	2021-2022
Postdoctoral Scholar , University of California, Santa Babara, CA Advisor: Bolin Liao, Ph.D. Project: Development of surface sensitive spectroscopic setups for characterization of engineering materials and nanomaterials.	2020-2021

- Developed and implemented time-resolved magneto-optical Kerr effect (TR-MOKE) spectroscopy setup for monitoring magnon-phonon interactions in a wide range of functional materials.
- Developed and implemented scanning ultrafast electron microscopy (SUEM) to investigate charge carrier and lattice dynamics near grain boundaries of polycrystalline materials relevant to energy applications. Using this setup surface photovoltage in doped silicon was studied and reported.

Graduate Research Assistant, Louisiana State University, Baton Rouge, LA

2015-2019

Advisor: Louis Haber, Ph.D.

Project: Ultrafast and real-time dynamics of nanomaterials studied by advanced spectroscopic techniques.

- Designed, developed, and implemented an in-situ experimental setup based on second harmonic generation and extinction spectroscopy for real-time monitoring of nanomaterial growth. Using this setup growth dynamics of gold, gold-silver, and silver-gold nanoparticles were studied and reported.
- Designed, constructed, and implemented a time-resolved transient absorption and reflectivity setup for probing and characterizing the electronic and structural properties of short-living excited states of photochemically/photophysically relevant samples. Using this setup ultrafast dynamics of porphyrin-based nanomaterials and silver-gold nanoparticles were studied.
- Engineering, synthesis, and characterization of nanomaterials for potential applications in sensing, catalysis, photovoltaics, and nanomedicine.

AREAS OF TEACHING EXPERTISE

Physical chemistry, general chemistry, physical chemistry lab, quantum chemistry, chemical thermodynamics, instrumental methods, spectroscopic methods, surface science

TEACHING & MENTORING EXPERIENCE

Graduate Teaching Assistant in General chemistry I, II, and lab, Louisiana State University, Baton Rouge, LA

2014-2018

- One-on-one assistance with analytical chemistry principles and lab techniques, experiment planning, failure analysis, and problem solving.
- Troubleshooting and calibration of laboratory instruments.
- Conducted recitation and laboratory classes to broader student's understanding on concepts of general chemistry.
- Took initiative to revise many of the experimental procedures to save the time and materials and to educate students more effectively.
- Planned lessons and assignments, led discussion sections, graded papers and exams.
- Supervised over 200 students doing experiments and writing professional laboratory reports.

Graduate Teaching Assistant in Physical Chemistry, Louisiana State University, Baton Rouge, LA

2016-2018

- Conducted recitation classes to broader student's understanding on concepts of physical chemistry.
- Arranged weekly meetings to evaluate the students' academic progress and help them prepare for exams.
- Graded weekly assignments, homework, and exam papers.

National Science Foundation Outreach Instructor, Louisiana State University, Baton Rouge, LA

2016-2019

- Prepared students from Kenilworth Science and Technology Charter School for national and international science fair competitions.
- Instructed students how to identify scientific problems.

- Instructed students how to synthesize nanoparticles step by step, analyze data, and making presentations.

Mentoring Graduate and Undergraduate Students

2017-now

- Helped students choose and design research projects.
- Instructed how to engineer materials and nanomaterials step by step.
- Taught and guided students through scientific experiments and instrumental analysis.
- Helped with developing research hypothesis and planning experiments to obtain data to prove a hypothesis.
- Critical thinking and analyzing experimental data.
- Trained members in the lab and other users in the university on how to operate different instruments (Raman spectrometer, time-resolved spectroscopy, UV-VIS spectrometer, dynamic light scattering).

Instructor, K-12 Teaching Program, Karadipuwal School, Puttalam, Sri Lanka

2012-2014

- Developed, presented hour-long lessons on science and mathematics
- Designed, administered, and graded quizzes, tests, and exams to assess students' understanding of the material
- Maintained accurate records of students' performance and progress.
- Ensured the class time is used effectively, balancing instructions, activities, and assessments.

HONORS & AWARDS

COACH Advancing Science travel award	2018
Louisiana Board of Regents and Louisiana EPSCoR poster award	2017
Louisiana Board of Regents and Louisiana EPSCoR poster award	2016

LEADERSHIP ACTIVITIES

Staff member in Super Science Saturday Programs sponsored by American Chemical Society and Louisiana State University (Super science Saturday is a free public outreach and science education event for kindergarten to 12 th grade students, parents, and anyone interested in seeing science in action)	2017-2018
Member of Sri Lankan Student Association, Louisiana State University	2016-2019
Vice President of Sri Lankan Student Association, Louisiana State University	2017-2018

ACADEMIC SERVICES

Guest editor at MDPI Biosensors journal	2024
Reviewer at Colloidal and Surface Science Journal (Science Publishing Group)	2020-now
Reviewer at Physical Chemistry Chemical Physics Journal (Royal Society of Chemistry)	2022-now
Participated as a judge to evaluate graduate, undergraduate, and high school student posters in Smalley-Curl Institute research colloquium (SCI Colloquium, Rice University)	2023-2024
Participated as a judge to evaluate undergraduate research presentations at Gulf Coast undergraduate research symposium	2023

PUBLICATIONS (*CO-FIRST AUTHOR)

Google Scholar - <https://scholar.google.com/citations?user=z5QPnSEAAAAJ&hl=en>

- Wu, W.; **Ranasinghe, J.C.***; Chatterjee, A.; Huang, S. Recent advances on Raman spectroscopy of graphene: Towards biosensing applications. **Materials Chemistry and Physics** 2024, 129281. 2024
- Ranasinghe, J.C.**; Wang, Z.; Huang, S. Unveiling brain disorders using liquid biopsy and Raman spectroscopy. **Nanoscale** 2024, 16, 11879-11913. 2024
- Ranasinghe, J.C.**; Wang, Z.; Huang, S. Raman spectroscopy on brain disorders: transition from fundamental research to clinical applications. **Biosensors** 2022, 13, 27. 2022
- Zhang, K.; Wang, Z.; Liu, H.; Perea-López, N.; **Ranasinghe, J.C.**; Bepete, G.; Minns, A.M.; Rossi, R.M.; Lindner, S.E.; Huang, S.X. Understanding the excitation wavelength dependence and thermal stability of the SARS-CoV-2 receptor-binding domain using surface-enhanced Raman scattering and machine learning. **ACS Photonics** 2022, 9, 2963-2972. 2022
- Ranasinghe, J.C.**; Jain, A.; Wu, W.; Zhang, K.; Wang, Z.; Huang, S. Engineered 2D materials for optical bioimaging and path toward therapy and tissue engineering. **Journal of Materials Research** 2022, 37, 1689-1713. 2022
- Wang, Z.; Ye, J.; Zhang, K.; Ding, L.; Granzier-Nakajima, T.; **Ranasinghe, J.C.**; Xue, Y.; Sharma, S.; Biase, I.; Terrones, M. Rapid biomarker screening of Alzheimer's disease by interpretable machine learning and graphene-assisted Raman spectroscopy. **ACS Nano** 2022, 16, 6426-6436. 2022
- Choudhry, U.; Kim, T.; Adams, M.; **Ranasinghe, J.C.**; Yang, R.; Liao, B. Characterizing microscale energy transport in materials with transient grating spectroscopy. **Journal of Applied Physics** 2021, 130. 2021
- Dikkumbura, A.S.; Hamal, P.; Chen, M.; Babayode, D.A.; **Ranasinghe, J.C.**; Lopata, K.; Haber, L.H. Growth dynamics of colloidal silver-gold core-shell nanoparticles studied by in situ second harmonic generation and extinction spectroscopy. **The Journal of Physical Chemistry C** 2021, 125, 25615-25623. 2021
- Hamal, P.; Subasinghe Don, V.; Nguyenhuu, H.; **Ranasinghe, J.C.**; Nauman, J.A.; McCarley, R.L.; Kumar, R.; Haber, L.H. Influence of temperature on molecular adsorption and transport at liposome surfaces studied by molecular dynamics simulations and second harmonic generation spectroscopy. **The Journal of Physical Chemistry B** 2021, 125, 10506-10513. 2021
- Karam, T.E.; Siraj, N.; **Ranasinghe, J.C.**; Kolic, P.E.; Regmi, B.P.; Warner, I.M.; Haber, L.H. Efficient photoinduced energy transfer in porphyrin-based nanomaterials. **The Journal of Physical Chemistry C** 2020, 124, 24533-24541. 2020
- Li, Y.; Choudhry, U.; **Ranasinghe, J.C.**; Ackerman, A.; Liao, B. Probing surface photovoltage effect using photoassisted secondary electron emission. **The Journal of Physical Chemistry A** 2020, 124, 5246-5252. 2020
- Ranasinghe, J.C.**; Dikkumbura, A.S.; Hamal, P.; Chen, M.; Khoury, R.A.; Smith, H.T.; Lopata, K.; Haber, L.H. Monitoring the growth dynamics of colloidal gold-silver core-shell nanoparticles using in situ second harmonic generation and extinction spectroscopy. **The Journal of Chemical Physics** 2019, 151. 2019
- Khoury, R.A.; **Ranasinghe, J.C.**; Dikkumbura, A.S.; Hamal, P.; Kumal, R.R.; Karam, T.E.; Smith, H.T.; Haber, L.H. Monitoring the seed-mediated growth of gold nanoparticles using in situ second harmonic generation and extinction spectroscopy. **The Journal of Physical Chemistry C** 2018, 122, 24400-24406. 2018

BOOK CHAPTERS

Zhang, K.; Jain, A.; Wu, W.; **Ranasinghe, J.C**; Wang, Z.; Huang, S. Optical Properties and Emerging Phenomena of Two-Dimensional Materials. In Novel Optical Materials; World Scientific: 2024; pp. 1-30. 2024

MANUSCRIPT SUBMITTED

Zhou, Y.; Ciarla, R.; Boonkird, A.; Nguyen, T.; Zhou, J.; Jiang, Z.; Zuo, X.; **Ranasinghe, J.C**; Hu, W.; Scott, B. Defects Vibrations Engineering for Enhancing Interfacial Thermal Transport. arXiv preprint arXiv:2310.10945, Submitted to Science Advances 2024

Wang, Z.; **Ranasinghe, R.C**; Chan, D.; Gomm, A.; Rudolph, T.; Zhang, C.; Zhang, N.; Allen, G.; Huang, S. Machine Learning Interpretation of Optical Spectroscopy Using Peak-Sensitive Logistic regression, Submitted to ACS Nano 2024

MANUSCRIPT IN PREPARATION

Ranasinghe, J.C.; Sanders, S.K.; Wang, Z.; Wu, W.; Dimitrov, E.; Terrones, M.; Alabastri, A.; Huang, S. Exploring Two-Dimensional Materials for Noise Engineering of Surface-Enhanced Raman Spectroscopy Substrates for SARS CoV-2 Receptor Binding Domain Detection 2024

Ranasinghe, J.C.; Wang, Z.; Chan, D.; Gomm, A.; Rudolph, T.; Zhang, C.; Zhang, N.; Allen, G.; Huang, S. A Molecularly Defined and Spatially Resolved Atlas of the Whole Mouse Brain Using Raman Spectroscopy and Machine Learning 2024

Ranasinghe, J.C.; Wang, Z.; Liang, T.; Wang, H.; Huang, S. Mapping Tumor Heterogeneity and Metabolomics of Pancreatic Ductal Adenocarcinoma Using Raman Hyperspectral Imaging with Machine Learning Interpretation 2024

SELECTED PRESENTATIONS

Two-Dimensional Material Facilitated Surface -Enhanced Raman Measurements of SARS CoV-2 Receptor Binding domain, Smalley-Curl Institute Summer Research Colloquium, Houston, TX. 2024

Designer Two-Dimensional Materials for Multiplexed Biosensing and Machine Learning-assisted Characterization, PUMP & PIPES Innovation on Demand Annual Event 2023

Rapid Biomarker Screening of Alzheimer's Disease by Interpretable Machine Learning and Two-Dimensional Material-Assisted Raman Spectroscopy, Smalley-Curl Institute Summer Research Colloquium, Houston, TX. 2023

Monitoring the Growth Dynamics of Colloidal Gold-Silver Core-Shell Nanoparticles Using In-Situ Second Harmonic Generation and Extinction Spectroscopy, OSA Ultrafast Optical Phenomena Technical Group Online Workshop 2020

Ultrafast Heating and Melting Dynamics Studied by Pump-Probe Reflectivity and Microscopy, LA-CIMM R11 Symposium, Baton Rouge, LA 2019

Ultrafast Transient Absorption Spectroscopy of Porphyrin-Based NanoGUMBOS, Silver-Gold Core-Shell, and Silicon Nanoparticles, 255th ACS National Meeting, New Orleans, LA 2018

Ultrafast Reflectivity Studies on Laser Heating and Melting Dynamics of Aluminum, Silicon, and Copper, LA-CIMM R11 Symposium, Baton Rouge, LA 2018

Ultrafast Spectroscopy and Microscopy of Materials and Nanomaterials, LA-CIMM R11 Symposium, Baton Rouge, LA 2016

Tuning the Optical Properties of Silicon Nanocrystals by Surface Functionalization, NOBCChE Joint Annual Southeast/Southwest Regional Meeting, Baton Rouge, LA 2016

REFERENCES

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