

INDIKA U. ARACHCHIGE, Ph. D.

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EDUCATION

- Ph.D., Inorganic Materials Chemistry, (2007) Wayne State University, Detroit, Michigan. Dissertation: "Sol-Gel Routes for Metal Chalcogenide Nanoparticle Assembly"
- B.Sc. (Honors) in Chemistry, (2001) University of Kelaniya, Sri Lanka.

RESEARCH EXPERIENCE AND PROFESSIONAL APPOINTMENTS

07/2024 – present	Professor, Virginia Commonwealth University
07/2017 - 06/2024	Associate Professor, Virginia Commonwealth University
08/2011 - 06/2017	Assistant Professor, Virginia Commonwealth University
04/2009 - 08/2011	Postdoctoral Research Associate, Los Alamos National Laboratory
08/2007 - 03/2009	Postdoctoral Research Fellow, Northwestern University
08/2002 - 07/2007	Graduate Research/Teaching Assistant, Wayne State University
01/2001 - 07/2002	Graduate Research/Teaching Assistant, University of Kelaniya, Sri Lanka

AWARDS AND FELLOWSHIPS

- National and International Recognition Award (NIRA) – VCU Office of the Provost, 2023
- VCU College of Humanities and Sciences – Excellence in Scholarship Award, 2017
- Esther and Stanley Kirschner Outstanding Graduate Student Award, 2007
- Wilfred Heller Outstanding Graduate Research Fellowship, Wayne State University, 2006-2007
- Dissertation Research Fellowship, Graduate School, Wayne State University, 2006

TEACHING EXPERIENCE AND COURSE DEVELOPMENT

1. **CHEM 622 Solid State and Materials Chemistry** (Spring 2015–16 and Spring 2018–24)
 - Developed a new course on solid state and materials chemistry for senior undergraduate and graduate students. Topics discussed include amorphous and crystalline solids, crystal structures, unit cells and packing, Miller indices, crystallographic directions and planes, crystal defects and non-stoichiometric compounds, phase diagrams and solid solutions, band structure and theory, powder X-ray diffraction and X-ray crystallography.
 - Developed a module in which students are required to write a review on an anonymized paper submitted to an ACS or RSC journal, critically analyze the strengths and weaknesses, and make recommendation for publication. In addition to grading by the instructor, part of the literature critique assignment score was based on peer-review by their classmates.
2. **CHEM 620 Advanced Inorganic Chemistry II** (Fall 2011–13, Fall 2014–15, and Fall 2016)
 - Incorporated fundamental principles of solid-state, organometallic, and nanochemistry into the traditional inorganic graduate level course. Used models to understand packing in solids and the internet to access short, public domain courses on the structures of solids and structure-property and size-property relationships of nanostructured and bulk materials.
 - Developed a module in which students are required to write a mini review or a proposal on a topic related to research conducted by VCU faculty. In addition to grading by the instructor, part of their assignment score was based on peer-review by their classmates.
 - Incorporated a literature presentation module in which students are required to conduct a literature search on a topic related to Inorganic Chemistry and present their findings.

3. **CHEM 102 General Chemistry II** (Spring 2012–13, Fall 2014–15, and Fall 2022)
 - Prepared a series of PowerPoint lectures including a collection of hot materials topics/videos to accompany the text for CHEM 102 and provided them to students online via Canvas.

4. **CHEM 320 Inorganic Chemistry I** (Spring 2017, Fall 2017–2021, and Fall 2024)
 - Prepared a series of PowerPoint lectures including a collection of online inorganic topics to accompany the CHEM 320 textbook and provided them to students via Blackboard/Canvas.
 - Developed a series of online homework, clicker and study question sets to practice specific concepts taught in class and evaluated student performance throughout the semester.

5. **Undergraduate, Masters and Doctoral Theses/Dissertations Directed**
 - **Griffin Spence**, Ph. D. in Chemistry, “Elucidation of the Optical Properties of Si and Si-Ge Alloy Nanostructures with Visible to Near-IR Photoluminescence”, May 2024.
 - **Lisa S. Graves**, Ph.D. in Chemistry, “Composition Dependent Effects on the Electrocatalytic Activity of Zn-doped Ni₂P, Ni₅P₄ and Cr-doped Ni Nanocrystals for the Hydrogen Evolution Reaction” May 2024.
 - **Rajib Sarkar**, Ph.D. in Chemistry, “Colloidal Synthesis of Noble Metal Nanoparticle Aerogels and Transition Metal Phosphide Nanocrystals as High Efficiency Electrocatalysts for Sustainable Energy Applications” May 2023.
 - **Drew Spera**, Ph.D. in Nanoscience and Nanotechnology, “Synthesis and Characterization of Ge_{1-x}Si_ySn_x Core and Ge_{1-x}Sn_x@SiO₂ Core-Shell Group IV Semiconductor Nanocrystals” May 2023.
 - **Rachel Barbieri**, Ph.D. in Nanoscience and Nanotechnology, “Direct-gap Group IV Alloys and Quantum Dots: Synthesis, Thin Film Fabrication, and Optical and Electrical Characterization” May 2022.
 - **Ebtesam H. A. Eladgham**, Ph.D. in Chemistry “Structure, Morphology and Composition-Property Elucidation of Ni–Mo and Ni–Mo–P Nanocrystals for Water Splitting Reactions and Group IV Alloy and Silicate Nanocrystals for Visible to Near IR Optoelectronics” May 2020.
 - **Venkatesham Tallapally**, Ph.D. in Chemistry, “Colloidal Synthesis and Photophysical Characterization of Group IV Alloy and Group IV-V Semiconductors: Ge.Sn and Sn-P Quantum Dot” August 2018.
 - **Christopher Ohlhaber**, M. Sc. in Chemistry, “Detection of 20-Hydroxyeicosatetraenoic Acid by Use of Surface Enhanced Raman Spectroscopy: Substrate Development and Detection” August 2018.
 - **Lamia Nahar**, Ph.D. in Chemistry, “Sol-Gel Chemistry: An Advanced Technique to Produce Macroscopic Nanostructures of Metal and Semiconductor Colloids” May 2017.
 - **Dilhara Liyanage**, M. Sc. in Chemistry, “Efficient Integration of Plasmonic and Excitonic Properties of Metal and Semiconductor Nanostructures via Sol-Gel Assembly” May 2017.
 - **Richard J Alan Esteves**, Ph. D. in Nanoscience and Nanotechnology, “The Dawn of New Quantum Dots: Synthesis and Characterization of Ge_{1-x}Sn_x Nanocrystals for Tunable Bandgaps”, December 2016.
 - **Xiaonan Gao**, Ph. D. in Chemistry, “Sol-Gel Assembly of Metal Nanostructures into Metallic Gel Frameworks and Their Applications”, May 2016.
 - **Jordan N. Nowaczyk**, B. Sc. (Honors) in Chemistry, “Synthesis and Characterization of Ag/Pd/Au Alloy Nanoparticles and Their Self-Assembly into Aerogels”, May 2016.
 - **Minh Q. Ho**, M. Sc. in Chemistry, “Colloidal Synthesis and Optical Characterization of Semiconductor Nanocrystals from Non-Toxic Elements”, December 2015.

RESEARCH INTERESTS AND SUPPORT

A. Funded Research Grants/Awards (PI = Principal Investigator)

Agency	Funding	Time period	Title/Role of the grant
VCU Breakthroughs Fund	\$200,000	07/01/2024-06/30/2026	Title: Direct-Gap Group IV Alloy Quantum Dots as Low-Cost and High-Efficiency Nanostructures for Generation-III Photovoltaics. Role: Arachchige, PI; Özgür and Lao, Co-PIs.
VCU Momentum Fund	\$200,000 (direct)	07/01/2023-06/30/2025	Title: Superatomic Transition Metal Clusters and Nanoparticles as High-Efficiency, Earth-Abundant, and Durable Electrocatalysts for Producing Sustainable Hydrogen Fuel from Water and Electricity. Role: Arachchige, PI; Jena and Gupta, Co-PIs
National Science Foundation - Division of Chemistry (CHE- 2154747)	\$429,412 (total)	08/15/2022-07/31/2025	Title: CAS: Bimetallic Transition Metal Phosphide Nanostructures as High-Efficiency, Earth-Abundant, and Durable Catalysts for Electrochemical Water Splitting. Role: Arachchige, PI; Lao, Co-PI
National Science Foundation-Division of Materials Research (DMR-2211606)	\$499,912 (total)	07/01/2022-06/30/2025	Title: Low-Dimensional Si-Sn and Si-Ge-Sn Nanoalloys as High-Efficiency, Direct-gap Nanostructures for Visible to Infrared Optoelectronics. Role: Arachchige, PI; Özgür and Lao, Co-PIs.
Presidential Research Quest Fund (PRQF)	\$50,000 (direct)	07/01/2021-12/31/2022	Title: Bimetallic Transition Metal Phosphide Nanostructures as High-Efficiency, Earth Abundant Catalysts for Electrochemical Water Splitting. Role: Arachchige, PI; Lao, Co-PI
VCU Commercialization Fund	\$28,000 (direct)	01/01/2020-12/31/2020	Title: Si-Sn and Ge-Sn Quantum Dots as Low-Cost, High-Efficiency Light Harvesting Materials for Generation-III Photovoltaics. Role: Arachchige, single PI
National Science Foundation - Chemistry (CHE-1851916)	\$312,309 (total)	04/01/2019-03/31/2023	Title: REU Site: Practices and Perspectives in Nanoscience and Chemical Biology. Role: Arachchige, PI; Ruder, co-PI
College of Humanities and Sciences-Catalyst Award	\$20,000 (direct)	02/01/2018-08/31/2019	Title: Low-Dimensional Si _{1-x} Sn _y Alloys for Low-Cost and High-Efficiency Solar Cells. Role: Arachchige, single PI

National Institute of Child Health and Human Development /NIH/DHHS (1U01HD087198-01)	\$4,228,935 (total)	09/17/2015-08/31/2019	Title: The Utilization of Photonic Technology to Rapidly Detect Bioactive Lipids Associated with Preeclampsia Development. Role: Arachchige, Co-I; Chalfant, Charles E.; PI; Walsh, Scott, PI; Wijesinghe, Shanaka, PI. This is a multi-PI grant.
National Science Foundation-Division of Materials Research (DMR-1506595)	\$389,074 (total)	06/01/2015-05/31/2019	Title: SusChEM: Synthesis and Structure-Property Elucidation of Direct-Bandgap Group IV Alloy Nanocrystals for Optoelectronic Applications. Role: Arachchige, PI; Özgür and Demchenko, Co-PIs
American Chemical Society: Petroleum Research Fund (52423-DNI10)	\$100,000 (direct)	09/01/2012-08/31/2015	Title: Sol-Gel Assembly of Metal Particles into a New Class of Porous Nanostructures and Their Application in Heterogeneous Catalysis. Role: Arachchige, single PI
Presidential Research Quest Fund (PRQF)	\$50,000 (direct)	07/01/2013-12/31/2014	Title: Direct-gap Group IV Nanocrystals as Cheap and Efficient Materials for Optoelectronic Applications. Role: Arachchige, single PI

B. Research in Progress

- Synthesis of Direct-Gap Group IV Semiconductor Nanocrystals for Application in High-Efficiency Optoelectronics.
- Direct Self-Supported Assembly of Noble Metal Nanoparticles into High-Surface-Area, Hierarchically Porous, Highly Conducting Superstructures (Aerogels) for Application in Surface Enhanced Raman Scattering and Heterogeneous Catalysis.
- Synthesis of Metal-Semiconductor Hybrid Nanostructures for Efficient Integration of Plasmonic and Excitonic Properties for Enhanced Light-Matter Interactions.
- Main Group and Transition Metal Phosphide Nanostructures as High-Efficiency, Earth-Abundant, and Durable Electrocatalysts for Producing Hydrogen from Water and Electricity.

C. Fellowships Received for Graduate Advisees under the Direction of Dr. Arachchige

- Graduate School Dissertation Assistantship, Spring 2023 (\$9,375 + tuition, **Rajib Sarkar**)
- Graduate School Dissertation Assistantship, Spring 2023 (\$9,375 + tuition, **Drew Spera**)
- Altria Research Fellowship, 2021/22 (\$19,000 + tuition, **Rajib Sarkar**)
- Altria Research Fellowship, 2019/20 (\$19,000 + tuition, **Ebtesam Eladgham**)
- Altria Research Fellowship, 2017/18 (\$18,000 + tuition/fees, **Venkatesham Tallapally**)
- Graduate School Dissertation Assistantship, 2016/17 (\$17,250 + tuition/fees, **Lamia Nahar**)
- Graduate School Dissertation Assistantship, 2016 (\$8,625 + tuition/fees, **Richard Esteves**)
- Altria Research Fellowship, 2015/16 (\$17,000 + tuition/fees, **Lamia Nahar**)
- Fred M. Hawkrige Summer Fellowship, 2015 (\$5,500 + fringe, **Lamia Nahar**)
- Altria Research Fellowship, 2014/15 (\$17,000 + tuition/fees, **Xiaonan Gao**)

D. VCU Undergraduate Research and Creative (UROP) Scholarships Received for Advisees:

Shihara Dewasinghe (summer 2017); **Piotr Woźniak** (summer 2017); **Nilan Vaghjiani** (summer 2016); and **Robert Haufler** (summer 2015).

PEER-REVIEWED JOURNAL ARTICLES (Citations >2900; h-index = 27; IF = Journal Impact Factor)

A1. Publications at VCU (Undergraduate co-authors are bold, *Corresponding author)

A1.1 Manuscripts Under Review

1. Spence, Griffin C.; Pate, David S.; Villot, Corentin; Fouzie, Roshana M.; Graves, Lisa S.; Lao, Ka Un; Ozgur, Umit; Arachchige, Indika U.* “Solid-State Synthesis of Si_{1-x}Ge_x Nanoalloys with Composition-Tunable Energy Gaps and Visible to Near Infrared Optical Properties” *Chem. Mater.* **2024**, submitted. (Manuscript ID: cm-2024-021842)

A1.2 Articles Published at VCU

2. Graves, Lisa, S.; Sarkar, Rajib; Baker, Jordon; Lao, Ka U.; Arachchige, Indika U.* “Structure and Morphology Controlled Synthesis of Hexagonal Ni_{2-x}Zn_xP Nanocrystals and Their Composition Dependent Electrocatalytic Activity for Hydrogen Evolution Reaction” *ACS Appl. Energy Mater.* **2024**, 7 (14), 5679–5690. DOI: <https://pubs.acs.org/doi/10.1021/acsaem.4c00539> [IF: 6.4]
3. Pate, David S.; Spence, Griffin, C.; Graves, Lisa S.; Arachchige, Indika U.; Ozgur, Umit “Size-Tunable Band Structure and Optical Properties of Colloidal Silicon Nanocrystals Synthesized via Thermal Disproportionation of Hydrogen Silsesquioxane Polymer” *J. Phys. Chem. C* **2024**, 128 (25), 10483–10491. DOI: /10.1021/acs.jpcc.4c01462 [IF: 4.2]
4. Spera, Drew Z.; Pate, David; Spence, Griffin C.; Villot, Corentin; Onukwughara, Chineme J.; **White, Daulton**; Lao, Ka. U.; Özgür, Ümit; Arachchige, Indika U.* “Colloidal Synthesis of Homogeneous Ge_{1-x-y}Si_ySn_x Nanoalloys with Composition-Tunable Visible to Near IR Optical Properties” *Chem. Mater.* **2023**, 35 (21), 9007-9018. DOI: 10.1021/acs.chemmater.3c01644 [IF: 10.5]
5. Sarkar, Rajib; Graves, Lisa S.; **Taylor, Jessie R.**; Arachchige, Indika U.* “Self-Supported Ag/Pt/Pd Alloy Aerogels as High Performance Bifunctional and Durable Electrocatalysts for Methanol and Ethanol Oxidation Reactions” *ACS Appl. Mater. Interfaces* **2023**, 15 (44), 50981-50993. DOI: 10.1021/acsami.3c07740 [IF: 10.3]
6. Graves, Lisa, S.; Sarkar, Rajib; Lao, Ka U.; Arachchige, Indika U.* “Composition-Dependent Electrocatalytic Activity of Zn-doped Ni₅P₄ Nanocrystals for the Hydrogen Evolution Reaction” *Chem. Mater.* **2023**, 35 (17), 6966–6978. DOI: 10.1021/acs.chemmater.3c01229 [IF: 10.5]
7. Spence, Griffin C.; Barbieri, Rachel C.; Pate, David; Graves, Lisa S.; Özgür, Ümit; Arachchige, and Indika U.* “Sn-Induced Synthesis of Highly Crystalline and Size-Confined Si Nanorods at Moderately High Temperatures Using Hydrogen Silsesquioxane” *J. Phys. Chem. C* **2023**, 127 (24), 11579–11590. DOI: <https://doi.org/10.1021/acs.jpcc.3c01308> [IF: 4.2]
8. Sarkar, Rajib; Farghaly, Ahmed; Arachchige, Indika U.* “Oxidative Self-Assembly of Au/Ag/Pt Alloy NPs into High Surface Area, Mesoporous, and Conductive Aerogels for Methanol Electro-Oxidation” *Chem Mater.* **2022**, 34, 5874–5887. DOI: <https://doi.org/10.1021/acs.chemmater.2c00717> [IF: 10.5]

9. Spera, Drew Z.; Arachchige, Indika U.* "Improved Surface Passivation of Colloidal Ge_{1-x}Sn_x Nanoalloys Through Amorphous SiO₂ Shell Growth" *J. Phys. Chem. C* **2022**, 126, 9862–9874. DOI: <https://doi.org/10.1021/acs.jpcc.2c00063> [IF: 4.2]
10. Barbieri, Rachel; Ding, Kai; Ozgur, Ümit; Arachchige, Indika U.* "Solution-Processed Ge_{1-x}Sn_x Alloy Nanocrystal Thin Films with High Electrical Conductivity and Tunable Energy Gaps" *Chem Mater.* **2021**, 33, 6897–6908. DOI: <https://doi.org/10.1021/acs.chemmater.1c01836> [IF: 10.5]
11. Liyanage, Dilhara; Spera, Drew Z.; Sarkar, Rajib; **Troesch, Brendan P.**; Nakagawara, Tanner A.; Özgür, Ümit; Arachchige, Indika U.* "CdSe/Ag Hybrid Aerogels: Integration of Plasmonic and Excitonic Properties of Metal–Semiconductor Nanostructures via Sol–Gel Assembly" *Adv. Photonics Res.* **2021**, 2100084. DOI: <https://doi.org/10.1002/adpr.202100084> [IF: 3.7]
12. Eladgham, Ebtesam H.; Rodene, Dylan, D.; Sarkar, Rajib; Arachchige, Indika U.* Gupta, Ram B. "Electrocatalytic Activity of Bimetallic Ni–Mo–P Nanocrystals for Hydrogen Evolution Reaction" *ACS Appl. Nano Mater.* **2020**, 3, 8199–8207. DOI: <https://doi.org/10.1021/acsanm.0c01624> [IF: 6.1]
13. Spera, Drew Z.; Arachchige, Indika U.* "Synthesis, Properties, and Applications of Zero and One Dimensional GeSn Nanostructures" *J. Vac. Sci. Technol. B* **2020**, 38, 030802/1–030802/7. DOI: <https://doi.org/10.1116/6.0000040> [IF: 1.5]
14. Rodene, Dylan, D.; Eladgham, Ebtesam H.; Gupta, Ram B., Arachchige, Indika U.* Tallapally, Venkatesham "Crystal Structure and Composition-Dependent Electrocatalytic Activity of Ni–Mo Nanoalloys for Water Splitting to Produce Hydrogen" *ACS Appl. Energy Mater.* **2019**, 2, 7112–7120. DOI: <https://doi.org/10.1021/acsaem.9b01043> [IF: 6.9]
15. Eladgham, Ebtesam H.; Demchenko, Denis O.; Nakagawara, Tanner A.; Özgür, Ümit; Arachchige, Indika U.* "Facile Synthesis of Highly Luminescent Lithium Silicate Nanocrystals with Varying Crystal Structure and Morphology" *CrystEngComm.* **2019**, 21, 1974–1983. DOI: <https://doi.org/10.1039/C8CE02120A> [IF: 3.8]
16. Tallapally, Venkatesham; Nakagawara, Tanner A.; Demchenko, Denis O.; Ümit Özgür; Arachchige, Indika U.* "Ge_{1-x}Sn_x Alloy Quantum Dots with Composition-Tunable Energy Gaps and Near-Infrared Photoluminescence" *Nanoscale* **2018**, 10, 20296–20305. DOI: <https://doi.org/10.1039/C8NR04399J> [IF: 8.3]
17. Ohlhaber, Christopher M.; Rutan, Sarah A.; Bertino, Massimo F.; Wijesinghe, Dayanjan S.; Arachchige, Indika U.* "Applications of Surface Enhanced Raman Scattering toward the Detection of the Bioactive Lipid 20-HETE" *ACS Appl. Nano Mater.* **2018**, 1, 4064–4072. DOI: <https://doi.org/10.1021/acsanm.8b00840> [IF: 6.1]
18. Nahar, Lamia; Farghaly, Ahmed A.; Esteves, Richard A; Arachchige, Indika U.* "Shape Controlled Synthesis of Au/Ag/Pd Nanoalloys and Their Oxidation-Induced Self-Assembly into Electrocatalytically Active Aerogel Monoliths" *Chem. Mater.* **2017**, 29, 7704–7715. DOI: <https://doi.org/10.1021/acs.chemmater.7b01731> [IF: 10.5]
19. Demchenko, Denis O.;* Tallapally, Venkatesham; Esteves, Richard J.; Hafiz, Shopan; Nakagawara, Tanner A.; Arachchige, Indika U.; Ümit Özgür "Optical Transitions and Excitonic Properties of Ge_{1-x}Sn_x Alloy Quantum Dots" *J. Phys. Chem. C* **2017**, 121, 18299–18306. DOI: <https://doi.org/10.1021/acs.jpcc.7b06458> [IF: 4.2]

20. Arachchige, Indika U.; Armatas G. S.; Biswas, K.; Subrahmanyam, K. S.; Lattur, S.; Malliakas, C. D.; Manos, M. J.; Oh, Y.; Polychronopoulou, P.; Poudeu, P. F. P.; Trikalitis, P. N.; Zhang, Q.; Zhao, L.-D.; Peter, S. C.,* “Mercuri G. Kanatzidis: Excellence and Innovations in Inorganic and Solid State Chemistry” *Inorg. Chem.* **2017**, *56*, 7582–7597.
DOI: <https://doi.org/10.1021/acs.inorgchem.7b00933> [IF: 5.4]
21. Esteves, Richard J.; Hafiz, Shopan A.; Demchenko, Denis O.; Özgür, Ümit; Arachchige, Indika U.* “Ultra-Small Ge_{1-x}Sn_x Quantum Dots with Visible Photoluminescence” *Chem. Commun.* **2016**, *52*, 11665–11668. DOI: <https://doi.org/10.1039/C6CC04242B> [IF: 6.1]
22. Hafiz, Shopan A.; Esteves, Richard J.; Demchenko, Denis O.; Arachchige, Indika U.; Özgür, Ümit* “Energy-Gap Tuning and Carrier Dynamics in Colloidal Ge_{1-x}Sn_x Quantum Dots” *J. Phys. Chem. Lett.* **2016**, *7*, 3295–3301. DOI: <https://doi.org/10.1021/acs.jpcclett.6b01333> [IF: 6.9]
23. Tallapally, Venkatesham; Esteves, Richard J.; Nahar, Lamia; Arachchige, Indika U.* “Multivariate Synthesis of Tin Phosphide Nanoparticles: Temperature, Time, and Ligand Control of Size, Shape, and Crystal Structure” *Chem. Mater.* **2016**, *28*, 5406–5414.
DOI: <https://doi.org/10.1021/acs.chemmater.6b01749> [IF: 10.5]
24. Sahoo, Nanda G.; Esteves, Richard J.; Punetha, Vinay D.; Pestov, Dimtry; Arachchige, Indika U.; McLeskey, James T.* “Schottky Diodes from 2D Germanane” *Appl. Phys. Lett.* **2016**, *109*, 023507/1–023507/4. DOI: <http://dx.doi.org/10.1063/1.4955463> [IF: 4.0]
25. Gao, Xiaonan; Esteves, Richard J.; Nahar, Lamia; **Nowaczyk, Jordan N.**; Arachchige, Indika U.* “Direct Cross-Linking of Au/Ag Alloy Nanoparticles into Monolithic Aerogels for Application in Surface Enhanced Raman Scattering” *ACS Appl. Mater. Interfaces* **2016**, *8*, 13076–13085.
DOI: <https://doi.org/10.1021/acsami.5b11582> [IF: 10.3]
26. Nahar, Lamia; Esteves, Richard J.; Hafiz, Shopan; Özgür, Ümit; Arachchige, Indika U.* “Metal-Semiconductor Hybrid Aerogels: Evolution of Optoelectronic Properties in a Low Dimensional CdSe/Ag Nanoparticle Assembly” *ACS Nano* **2015**, *9*, 9810–9821.
DOI: <https://doi.org/10.1021/acs.nano.5b02777> [IF: 18.0]
27. Ho, Min Q.; Esteves, Richard J.; Kedarnath, Gotluru; Arachchige, Indika U.* “Size Dependent Optical Properties of Luminescent Zn₃P₂ Nanocrystals” *J. Phys. Chem. C.* **2015**, *119*, 10576–10584. DOI: <https://doi.org/10.1021/acs.jpcc.5b01747> [IF: 4.2]
28. Esteves, Richard J.; Ho, Min Q.; Arachchige, Indika U.* “Nanocrystalline Group IV Alloy Semiconductors: Synthesis and Characterization of Ge_{1-x}Sn_x Quantum Dots for Tunable Bandgaps” *Chem. Mater.* **2015**, *27*, 1559–1568.
DOI: <https://doi.org/10.1021/cm503983b> [IF: 10.5]
29. Altarawneh, Suha; Nahar, Lamia; Arachchige, Indika U.;* El-Ballouli, Ala’ O.; Hallal, Kassem M.; Kaafarani, Bilal R.;* Rabbani, Mohammad G.; Arvapally, Ravi K.; El-Kaderi, Hani M.* “Highly Porous and Photoluminescent Pyrenequinoxaline-Derived Benzimidazole-Linked Polymers” *J. Mater. Chem. A* **2015**, *3*, 3006–3010.
DOI: <https://doi.org/10.1039/C4TA05727A> [IF: 14.5]
30. Gao, Xiaonan; Esteves, Richard J.; **Luong, Thi T. H.**; **Jaini, Rajendra**; Arachchige, Indika U.* “Oxidation-Induced Self-Assembly of Ag Nanoshells into Transparent and Opaque Ag Hydrogels and Aerogels” *J. Am. Chem. Soc.* **2014**, *136*, 7993–8002.
DOI: <https://doi.org/10.1021/ja5020037> [IF: 16.3]

31. Kulugamma, Ranmohotti G.; Gao, Xiaonan; [Arachchige, Indika U.](#)* “Salt-Mediated Self-Assembly of Metal Nanoshells into Metallic Aerogels” *Chem. Mater.* **2013**, 25, 3528–3534. DOI: <https://doi.org/10.1021/cm401968j> [IF: 10.5]
32. Nahar, Lamia; [Arachchige, Indika U.](#)* “Sol-Gel Methods for the Assembly of Metal and Semiconductor Nanoparticles” *JSM Nanotechnol. Nanomed.* **2013**, 1, 1004/1–1004/6. DOI: <https://doi.org/10.47739/2334-1815/1004>

A2. Publications from Undergraduate, Graduate, and Postdoctoral Research

33. Soriano, Ronlad A.; [Arachchige, Indika U.](#); Malliakas, Christos D.; Wu, Jinsong; Kanatzidis, Mercouri G.* “Nanoscale Stabilization of New Phases in the PbTe–Sb₂Te₃ System: Pb_mSb_{2n}Te_{m+3n} Nanocrystals” *J. Am. Chem. Soc.* **2013**, 135, 768–774. DOI: <https://doi.org/10.1021/ja309626q> [IF: 16.3]
34. Ivanov, Sergei A.;* [Arachchige, Indika U.](#); Aikens, Christine M.* “Density Functional Analysis of Geometries and Electronic Structures of Gold-Phosphine Clusters. The Case of Au₄(PR₃)₄²⁺ and Au₄(μ₂-I)₂(PR₃)₄” *J. Phys. Chem. A* **2011**, 115, 8017–8031. DOI: <https://doi.org/10.1021/jp200346c> [IF: 2.9]
35. [Arachchige, Indika U.](#); Malliakas, Christos D.; Soriano, Ronlad A.; Ivanov, Sergei A.; Kanatzidis, Mercouri G.* “Amorphous and Crystalline GeTe Nanoparticles” *Adv. Funct. Mater.* **2011**, 21, 2737–2743. DOI: <https://doi.org/10.1002/adfm.201100633> [IF: 19.9]
36. Wu, Jinsong;* He, Jiaqing; Han, Mi-Kyung; Sootsman, Joseph R.; Girard, S.; [Arachchige, Indika U.](#); Kanatzidis, Mercouri G.; Dravid, Vinayak P., “Electron-Beam Activated Thermal Sputtering of Thermoelectric Materials” *J. Appl. Phys.* **2011**, 110, 044325/1–044325/6. DOI: <https://doi.org/10.1063/1.3624755> [IF: 2.9]
37. Wang, Ruomiao; Li, Li; [Arachchige, Indika U.](#); Ganguly, Shreyashi; Brock, Stephanie L.; Mao, Guangzhao,* “Nanoparticles Change the Ordering Pattern of n-Carboxylic Acids into Nanorods on HOPG” *ACS Nano* **2010**, 4, 6687–6696. DOI: [10.1021/nn102184y](https://doi.org/10.1021/nn102184y) [IF: 18.0]
38. Pala, Irina R.; [Arachchige, Indika U.](#); Georgiev, Daniel G.; Brock, Stephanie L.* “Reversible Gelation of II-VI Nanocrystals: The Nature of Interparticle Bonding and the Origin of Nanocrystal Photochemical Instability” *Angew. Chem. Int. Ed.* **2010**, 49, 3661–3665. DOI: <https://doi.org/10.1002/anie.201000034> [IF: 16.8]
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40. Yao, Qinghong; [Arachchige, Indika U.](#); Brock, Stephanie L.* “Expanding the Repertoire of Chalcogenide Nanocrystal Networks: Ag₂Se Gels and Aerogels by Cation Exchange Reactions” *J. Am. Chem. Soc.* **2009**, 131, 2800–2801. DOI: <https://doi.org/10.1021/ja900042y> [IF: 16.3]
41. [Arachchige, Indika U.](#); Wu, Jinsong; Dravid, Vinayak P.; Kanatzidis, Mercouri G.* “Nanocrystals of the Quaternary Thermoelectric Materials AgPb_mSbTe_{m+2} (m=1-18): Phase-Segregated or Solid Solutions?” *Adv. Mater.* **2008**, 20, 3638–3642. DOI: <https://doi.org/10.1002/adma.200801116> [IF: 32.0]

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43. Arachchige, Indika U.; Brock, Stephanie L.* “Highly Luminescent Quantum Dot Monoliths” *J. Am. Chem. Soc.* **2007**, 129, 1840–1841. (Highlighted by *Science* **2007**, 315, 741). DOI: <https://doi.org/10.1021/ja066749c> [IF: 16.3]
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45. Arachchige, Indika U.; Mohanan, Jaya L.; Brock, Stephanie L.* “Sol-Gel Processing of Semiconducting Metal Chalcogenide Xerogels: Influence of Dimensionality on Quantum Confinement Effects in a Nanoparticle Network” *Chem. Mater.* **2005**, 17, 6644–6650. DOI: <https://doi.org/10.1021/cm0518325> [IF: 10.5]
46. Mohanan, Jaya L.; Arachchige, Indika U.; Brock, Stephanie L.* “Porous Semiconductor Chalcogenide Aerogels” *Science* **2005**, 307, 397–400. DOI: 10.1126/science.1104226 [IF: 63.7]
47. Chen, Dongzhong; Wang, Ruomiao; Arachchige, Indika U.; Mao, Guangzhao;* Brock, Stephanie L., “Particle–Rod Hybrids: Growth of Arachidic Acid Molecular Rods from Capped Cadmium Selenide Nanoparticles” *J. Am. Chem. Soc.* **2004**, 126, 16290–16291. DOI: <https://doi.org/10.1021/ja045011x> [IF: 16.3]
48. Weerasooriya, R.* Tobschall, H. J.; Wijesekara, H. K. D. K; Arachchige, E. K. I. A. U. K.; Pathiratne, K. A. S., “On the Mechanistic Modeling of As(III) Adsorption on Gibbsite” *Chemosphere* **2003**, 51, 1001–1013. DOI: [https://doi.org/10.1016/S0045-6535\(03\)00157-7](https://doi.org/10.1016/S0045-6535(03)00157-7) [IF: 8.9]

B. Invited Review Articles

49. Arachchige, Indika U.; Brock, Stephanie L.* “Sol-Gel Method for the Assembly of Metal-Chalcogenide Quantum Dots” *Acc. Chem. Res.* **2007**, 40, 801–809. DOI: <https://doi.org/10.1021/ar600028s> [IF: 24.5]
50. Brock, Stephanie L.*; Arachchige, Indika U.; Kalebaila, Kennedy K., “Metal Chalcogenide Gels, Xerogels and Aerogels” *Comments Inorg. Chem.* **2006**, 27, 103–126. DOI: <https://doi.org/10.1080/02603590601084434> [IF: 5.5]

C. Patents

51. Arachchige, Indika U.; Özgür, Umit; Demchenko, Denis O.; Tallapally, Venkatesham; Nakagawara Tanner A. “Direct-Gap Group IV Alloy Nanocrystals with Composition Tunable Energy Gaps and Near Infrared Photoluminescence” United States Patent # 11,556,173; issued 01/31/2023.
52. Rodene, Dylan D.; Eladgham, E.E.; Arachchige, Indika U.; Gupta, Ram B.; “Pure-Phase Cubic Ni_{1-x}Mo_x Alloy Nanoparticles as Low-Cost, Earth Abundant and Durable Electrocatalysts for Water Splitting to Produce Hydrogen” International Application Published Under the Patent Cooperation Treaty (PCT) (19), World Intellectual Property Organization International Bureau (43). Publication Number: WO 2021/046099 A1; Publication Date: March 11, 2021.

53. Mao, Guangzhao; Brock, Stephanie L.; Chen, Dongzhong; Wang, Ruomiao; Arachchige, Indika U., "Particle-Rod Nanostructures and Method of Forming Same by Spin Coating" U.S. Patent # 7,709,054; issued 05/04/2010.

D. Book Chapters

54. Wang, Ruomiao; Arachchige, Indika U.; Brock, Stephanie L.; Mao, Guangzhao, "Nanoparticles as Seeds for Organic Crystallization" in **ACS Symposium Series No. 996/Nanoparticles: Synthesis, Stabilization, Passivation and Functionalization** R. Nagarajan and T. A. Hatton, Eds., 2008, pp 358–368.

INVITED SEMINARS AT UNIVERSITIES AND INTERNATIONAL MEETINGS

1. Arachchige, Indika U. "Synthesis and Structure-Property Elucidation of Group IV Semiconductor Nanocrystals and Metal Nanoparticle Superstructures" Department of Chemistry, Jackson State University, Jackson, MS, 04/12/2024.
2. Arachchige, Indika U., "Trimetallic Alloy Aerogels: A Class of High Efficiency Bifunctional and Durable Electrocatalysts for Alcohol Oxidation Reactions" 2023 Sol-Gel Symposium of China & International Forum, Shandong University, Jinan, China, 10/20/2023-10/23/2023.
3. Arachchige, Indika U., "Trimetallic Alloy Aerogels: A Class of High Efficiency Bifunctional and Durable Electrocatalysts for Alcohol Oxidation Reactions" 2023 Sol-Gel Symposium of China & International Forum, Shandong University, Jinan, China, 10/20/2023-10/23/2023.
4. Arachchige, Indika U. "Synthesis and Structure-Property Elucidation of Group IV Semiconductor Nanostructures and Metal Nanoparticle Superstructures" Key Note Speaker of the Annual Graduate Student Symposium, Department of Chemistry, Wayne State University, Detroit, MI, 10/08/2022.
5. Arachchige, Indika U. "Non-ordered Noble Metal Nanoparticle Superstructures: Aerogels for Enhanced Chemical Sensing and Electrocatalysis" Symposium NM3: Aerogels and Aerogel-Inspired Materials, Materials Research Society Spring Meeting, Phoenix, AZ, 04/17/17-04/21/17.
6. Arachchige, Indika U. "Colloidal Synthesis and Exciton Carrier Dynamics of Group IV Alloy Nanocrystals: An Experimental and Theoretical Study" Department of Chemistry, Old Dominion University, Norfolk, VA, 03/02/2017.
7. Arachchige, Indika U. "Colloidal Synthesis and Exciton Carrier Dynamics of Group IV Alloy Nanocrystals: An Experimental and Theoretical Study" Department of Chemistry, George Washington University, Washington D. C., 09/30/2016.
8. Arachchige, Indika U. "Synthesis and Structure-Property Elucidation of Group IV Semiconductor Nanocrystals and Metal Hollow Particle Superstructures" Department of Chemistry, Georgetown University, Washington D. C., 03/17/2016.
7. Arachchige, Indika U. "Synthesis and Structure-Property Elucidation of Group IV Semiconductor Nanocrystals and Metal Hollow Particle Superstructures" Department of Chemistry, Western Carolina University, Cullowhee, NC, 10/02/2015.
8. Arachchige, Indika U. "Synthesis and Structure-Property Elucidation of Group IV Semiconductor Nanocrystals and Metal Hollow Particle Superstructures" Department of Chemistry, George Mason University, Fairfax, VA, 09/17/2015.

9. Arachchige, Indika U. "Synthesis and Structure-Property Elucidation of Group IV Semiconductor Nanocrystals and Metal Hollow Particle Superstructures" Department of Chemistry, James Madison University, Harrisonburg, VA, 09/10/2015.
10. Arachchige, Indika U. "Synthesis and Structure-Property Elucidation of Group IV Semiconductor Nanocrystals and Metal Hollow Particle Superstructures" Department of Physics, Virginia Commonwealth University, Richmond, VA, 04/10/2015.
11. Arachchige, Indika U. "Synthesis and Structure-Property Elucidation of Group IV Semiconductor Nanocrystals and Metal Hollow Particle Superstructures" Department of Chemistry, University of Mary Washington, Fredericksburg, VA, 03/27/2015.
12. Arachchige, Indika U. "Synthesis and Structure-Property Elucidation of Group IV Semiconductor Nanocrystals and Metal Hollow Particle Superstructures" Department of Chemistry, Duquesne University, Pittsburgh, PA, 03/20/2015.

DEPARTMENT, COLLEGE, AND COMMUNITY SERVICE

A. Internal Service

A1. Department of Chemistry

- Principal Investigator, NSF-Research Experiences for Undergraduates (REU) program, 2019–22
The objective of this program is to recruit undergraduate students from PUIs and HBCUs and train them in research techniques (practices) with career preparation and scientific awareness activities (perspectives) in chemistry in collaboration with VCU chemistry faculty and industrial (Pfizer/GSK pharmaceuticals/Haleon Inc.) scientists. This program ran for 10.5 weeks over the summer and supported eight undergraduate students yearly (24 total).
- Chair of the Graduate Recruitment and Admissions Committee, 2017–present
- Chair of the faculty attendance policy for courses and labs committee, 2023
- Assisted drafting Chemistry MS/PhD program information for Academic Program Review, 2023
- Member of the Graduate Recruitment and Admissions Committee, 2011–16
- Designated approver, VCU Accelerated BS/MS Program, 2022–present
- Member of the Physical Chemistry Faculty Search Committee, 2018/2019
- Member of the third year review committee, Dr. Ka Un Lao (spring 2022)
- Member of the third year review committee, Dr. Sherif Moussa (spring 2018)
- Member of the third year (spring 2019) and full tenure (fall 2022) review committees, Dr. Dhakal
- Member of the High School Chemistry Committee, 2015–2017
- Member of the Nanoscience Faculty Search Committee, 2014/2015
- Member of the Chemistry Department Safety Committee, 2012/2013
- Recording of Faculty Meeting Minutes, 2011–2013 continuously
- Current member of eight doctoral dissertation committees in the chemistry department
- Past member of 37 doctoral and master's thesis committees, 2012–23
- Outside examiner on several dissertation committees (Engineering and Physics)

A2. College of Humanities and Sciences (CHS) and the University

- Member of the CHS Research Space Committee, 2022
- Member of the CHS Faculty Advisory Committee on Scholarly Leave, 2022
- Member of the CHS Faculty Council, 2016-2019 continuously
- Member of the promotion and tenure committee, Dr. Patrick H. Woodworth (Physics)
- Member of the promotion and tenure committee, Dr. Yelena Pork (Physics)

- Alternate member of the VCU Faculty Senate, 2016/2017
- Reviewer, CHS Catalyst and Seed proposal panel, multiple years
- Reviewer, Undergraduate Research Opportunities Program (UROP), 2015/16
- Reviewer, CHS-Baldacci Student Experiential Learning Endowed Fund, 2017-2020, spring 2023
- Reviewer, Dean's Scholarship Awards of the College of Humanities and Sciences, 2014/15
- Reviewer, VCU Presidential Research Quest Fund (PeRQ), multiple years
- Reviewer, VCU Breakthroughs Fund, 2021/22
- Reviewer, VCU Institute for Sustainable Energy and Environment (ISEE), 2021/22

B. External Service

B1. Review of Proposals for Public and Private Agencies

- Panel Reviewer, NSF–Division of Materials Research (DMR): Electronic and Photonic Materials (EPM) and Solid State and Materials Chemistry (SSMC) programs, multiple years.
- Panel Reviewer, NSF–Division of Chemistry (CHE): Research Experiences for Undergraduate (REU) and Macromolecular, Supramolecular and Nanochemistry (MSN), and Chemical Catalysis (CAT) programs, multiple years.
 - Ad-hoc Reviewer, NSF–Solid State and Materials Chemistry (SSMC) and Metals and Metallic Nanostructures (MMN) programs, multiple years.
 - Ad-hoc Reviewer, NSF–Centers of Research Excellence in Science & Technology (CREST), Research Infrastructure for Science and Engineering (RISE), Broadening Participation Research (BPR) in STEM, and Excellence in Research (EiR) programs, multiple years.
 - Ad-hoc Reviewer, European Research Council (ERC) Synthetic & Materials Chemistry program and ERC Consolidator Grant 2022 program, multiple years.
 - Ad-hoc Reviewer, Swiss National Science Foundation (SNSF): Division of Mathematics, Physical and Engineering Sciences, 2018–2020.
 - Ad-hoc Reviewer, American Chemical Society–Petroleum Research Fund, multiple years.
 - Ad-hoc Reviewer, VA Commonwealth Research Commercialization Fund (CRCF).
 - Ad-hoc Reviewer, NASA and PRESTIGE Postdoctoral Research programs.
 - Ad-hoc Reviewer, Stanford Synchrotron Radiation Light Source (SSRL) user proposals.

B4. Editorial Board Memberships

- Associate Editor, Frontiers in Chemistry journal.
- Member of the editorial board of JSM Nanotechnology and Nanomedicine.
- Member of the editorial board of International Journal of Nano-studies & Technology (IJNST).

B5. Community Service and Outreach

- Founder and Organizer of Summer Research Experience for Educators and Students (SREES) program. The objective of this eight weeks long summer research program is to educate economically disadvantaged high school students and teachers on scientific research by actively participating them in nanoscience research projects at VCU Chemistry laboratories. To date, two high school teachers and five high school students were hosted through this initiative in Dr. Arachchige's lab (2013–2015).
- Undergraduate Student Mentor, NSF–REU program. Six REU students were hosted in the Arachchige Lab in 2012–2014 and 2019–2022.
- Undergraduate Student Mentor, VCU-China Student Exchange program. Two student visitors were hosted in the Arachchige lab in summer 2013–2014.
- Participating faculty member of high school student visits to VCU Chemistry research labs. Facilitated a tour of ~10-15 students from Piedmont Virginia Community College and Maggie Walker Governor's School, followed by a discussion of on-going projects (2019 and 2023).
- High School Student mentor, ACS–SEED project. Two ACS-SEED supported high school students were hosted in the Arachchige lab in summer 2017 and 2023.

B5. Member of the Organizing Committee for

- Co-organizer of the STEM Research Day at Martin Luther King Jr. Middle School, 03/25/14.
- Judge for Virginia Junior Academy of Science Symposium, Richmond, VA, 05/15/14.
- Judge for Chesapeake Bay Governor's School Science Symposium, 03/15/14.

B6. Presider at National and Regional American Chemical Society (ACS) Meetings

- Nanoscience Session Chair at Spring 2022 ACS National Meeting (San Diego, CA)
- Nanoscience Synthesis Session Chair at 252nd ACS National Meeting (Philadelphia, PA)
- Colloids and Surface Chemistry Session Chair at 250th ACS National Meeting (Boston, MA)
- Nanoscience Synthesis Session Chair at 245th ACS National Meeting (New Orleans, LA)
- Chemistry of Materials Session Chair at 65th American Chemical Society Southeastern Regional Meeting (Atlanta, GA).

RESEARCH COLLABORATIONS (Name; Institution; and the Nature of Collaboration)

- Prof. Ümit Özgür; Dept. of Electrical Engineering, VCU; Ultrafast carrier dynamics and optoelectronic device fabrication of Group IV nanostructures and quantum dots.
- Prof. Denis Demchenko; Dept. of Physics, VCU; Computational simulations of quantum dots.
- Prof. Ka Un Lao; Dept. of Chemistry, VCU; Computational calculations on metal phosphides for electrochemical water splitting and Group IV nanostructures for optoelectronics.
- Prof. Ram Gupta; Dept of Chemical and Life Science Engineering, VCU; Nanomaterials for electrocatalysis and photocatalysis.
- Prof. Puru Jena; Dept. of Physics, VCU; Computational calculations of transition metal phosphide and boride nanostructures for photo-/electrochemical water splitting.
- Prof. Soma Dhakal, Dept. of Chemistry, VCU; DNA assisted synthesis of luminescent Au and Ag nanoclusters.
- Prof. Massimo Bertino; Dept. of Physics, VCU; Raman Spectroscopy.
- Prof. Sarah Rutan; Dept. of Chemistry, VCU; Chemometric analysis of Raman spectra.
- Prof. Shanaka Wijesinghe; Dept. of Pharmacy, VCU; Raman analysis of lipids.
- Prof. Arun Subramanian; Dept. of Department of Mechanical and Industrial Engineering, University of Illinois, Chicago; Nanostructured Materials for Li-and Na-ion batteries.
- Prof. Channa De Silva; Dept. of Chemistry, Western Carolina University; Theoretical studies on nanomaterials and antibacterial studies on plasmonic nanoparticles and aerogels.
- Prof. James McLeskey; Director of Engineering Programs and Professor of Engineering Physics, Randolph-Macon College; Solar cells and optical diodes fabrication.
- Dr. Prashanth Upadhyay; Senior Scientist at Indian Space Research Organization, Karnataka, India; Steady state and ultrafast absorption and emission spectroscopy.
- Dr. Ahmed A. Farghaly; Electroanalytical Chemist, Chemical Sciences and Engineering, Argonne National Laboratory; Nanostructured materials for electrocatalytic applications.