

## Education

- 2015–2020 **PhD Materials Science and Engineering,**  
*Northwestern University, Evanston, IL.*  
GPA: 3.90/4.00  
Thesis: *"Probing static and dynamic phenomena in two-dimensionally confined systems"*  
Certificate: Management for Scientists and Engineers, *Kellogg School of Management*  
Advisor: Professor Vinayak P. Dravid
- 2012–2015 **BS Materials Science and Engineering,**  
*University of Illinois at Urbana-Champaign, Champaign, IL.*  
GPA: 3.96/4.00

## Experience

### Fermi National Accelerator Laboratory (FNAL).

- 2022–Present *Quantum Associate Scientist*
- 2021–2022 *Postdoctoral Research Associate*
- Investigated the role of two level systems in quantum devices using advanced microscopy techniques
  - Acquired an understanding of chemical constituents present at interfaces in quantum systems through surface spectroscopy and spectrometry methods
  - Collaborated with scientists at FNAL, Northwestern University, Ames Laboratory, and Rigetti Computing within the Superconducting Materials and Systems National Quantum Initiative center to advance understanding of loss mechanisms in superconducting qubits

### ASM America.

- 2020–2021 *Senior Process Engineer*
- Designed and conducted a variety of process engineering experiments centered around atomic layer deposition of high-K dielectric thin films
  - Analyzed data and generated internal and external technical reports to address challenging engineering problems that customers were facing

## Publications (25 Published Peer-Reviewed Articles)

- 2022 **Murthy, A. A.;** Das, P. M.; Ribet, S. M.; Kopas, C.; Lee, J.; Reagor, M. J.; Zhou, L.; Kramer, M. J.; Hersam, M. C.; Checchin, M.; Grassellino, A.; dos Reis, R.; Dravid, V. P.; Romanenko, A., Developing a Chemical and Structural Understanding of the Surface Oxide in a Niobium Superconducting Qubit. *arXiv preprint arXiv:2203.08710*.
- 2022 **Murthy, A. A.;** Lee, J.; Kopas, C.; Reagor, M. J.; McFadden, A. P.; Pappas, D. P.; Checchin, M.; Grassellino, A.; Romanenko, A., TOF-SIMS analysis of decoherence sources in superconducting qubits. *App. Phys. Lett.* 120 (4), **2022**, 044002.
- 2022 Stanev, T. K.; Liu, P.; Zeng, H.; Lenferink, E. J.; **Murthy, A. A.;** Speiser, N.; Watanabe, K.; Taniguchi, T.; Dravid, V. P.; Stern, N. P., Direct Patterning of Optoelectronic Nanostructures using Encapsulated Layered Transition Metal Dichalcogenides. *ACS App. Mater. Interfaces*, 14 (20), **2022**, 23775–23784.
- 2021 Lee, J. Y.; Sung, Z; **Murthy, A. A.;** Kopas, C.; Reagor, M.; Grassellino, A.; Romanenko, A., Discovery of Nb hydride precipitates in superconducting qubits. *arXiv preprint arXiv:2108.10385*.
- 2021 **Murthy, A. A.\*;** Ribet, S. M.\*; Roth, E. W.; dos Reis, R.; Dravid, V. P., Imaging Hard-Soft Interfaces in Low-Dimensional Nanocomposites with Electron Microscopy. [invited review - *Materials Today*] 50, **2021**, 100-115.

- 2021 **Murthy, A. A.**; Stanev, T. K.; Ribet, S. M.; Watanabe, K.; Taniguchi, T.; Stern, N. P.; dos Reis, R.; Dravid, V. P., Spatial Mapping of Electrostatic Fields across 2D Heterostructures. *Nano Lett.* 21 (17), **2021**, 7131-7137.
- 2021 Amsterdam, S. H.; Stanev, T. K.; Wang, L.; Zhou, Q.; Irgen-Giorgio, S.; Padgaonkar, S.; **Murthy, A. A.**; Sangwan, V. K.; Dravid, V.P.; Weiss, E. A.; Darancet, P.; Chan, M. K. Y.; Hersam, M. C.; Stern, N. P.; Marks, T. J., Mechanistic Investigation of Molybdenum Disulfide Defect Photoluminescence Quenching by Adsorbed Metallophthalocyanines. *J. Am. Chem. Soc.* 143 (41), **2021**, 17153-17161.
- 2021 Dereshgi, S. A.; Larciprete, M. C.; Centini, M.; **Murthy, A. A.**; Tang, K.; Wu, J.; Dravid, V. P.; Aydin, K., Tuning of Optical Phonons in  $\alpha$ -MoO<sub>3</sub>-VO<sub>2</sub> Multilayers *ACS App. Mater. Interfaces*, 13 (41), **2021**, 48981-48987.
- 2021 LaMountain, T.; Nelson, J.; Lenferink, E. J.; Amsterdam, S. H.; **Murthy, A. A.**; Marks, T. J.; Dravid, V.P.; Hersam, M. C.; Stern, N. P., Valley-selective Optical Stark Effect of Exciton-Polaritons in a Monolayer Semiconductor. *Nat. Commun.* 12 (1), **2021**, 1-7.
- 2021 DiStefano, J. G.; **Murthy, A. A.**; Lescott, C. J.; dos Reis, R.; Li, Y.; Dravid, V.P., Structural defects in transition metal dichalcogenide core-shell architectures. *App. Phys. Lett.* 118 (22), **2021**, 223103.
- 2020 DiStefano, J. G.; **Murthy, A. A.**; Hao, S.; dos Reis, R.; Wolverton, C.; Dravid, V.P., Au@MoS<sub>2</sub>@WS<sub>2</sub> Topology of Transition Metal Dichalcogenides: The Case of the Core-Shell Architecture.[invited review - *Nanoscale*] 12 (47), **2020**, 23897-23919.
- 2020 **Murthy, A. A.**; Stanev, T. K.; dos Reis, R.; Hao, S.; Wolverton, C.; Stern, N. P.; Dravid, V. P., Direct Visualization of Electric Field induced Structural Dynamics in Monolayer Transition Metal Dichalcogenides. *ACS Nano*, 14 (2), **2020**, 1569-1576.
- 2020 DiStefano, J. G.; **Murthy, A. A.**; Lescott, C. J.; dos Reis, R.; Li, Y.; Dravid, V.P., Au@MoS<sub>2</sub>@WS<sub>2</sub> Core-Shell Architectures: Combining Vapor Phase and Solution-Based Approaches. *J. Phys. Chem. C* 124 (4), **2020**, 2627-2633.
- 2020 Dereshgi, S. A.; Folland, T. G.; **Murthy, A. A.**; Song, X.; Tanriover, I.; Dravid, V. P.; Caldwell, J. D.; Aydin, K., Lithography-Free, Planar IR Polarization Filters and Converters via Biaxial Phonons in  $\alpha$ -MoO<sub>3</sub> Flakes Integrated into Fabry-Perot Cavities *Nat. Commun.*, 11 (1), **2020**, 1-9.
- 2020 Wei, C.; Dereshgi, S. A.; Song, X.; **Murthy, A. A.**; Dravid, V. P.; Aydin, K.; Cao, T., Polarization Reflector/Color Filter at Visible Frequencies via Anisotropic  $\alpha$ -MoO<sub>3</sub>. *Adv. Opt. Mater.*, **2020**, 2000088.
- 2019 Li, Y.; **Murthy, A. A.**; DiStefano, J. G.; Jung, H. J.; Palacios, E.; Hao, S.; Wolverton, C.; Aydin, K.; Chen, X.; Dravid, V.P., MoS<sub>2</sub>-capped Cu<sub>x</sub>S Nanocrystals: A New Route for Broadband Photodetection with Transition Metal Dichalcogenides. *Mater. Horiz.* 6 (3), **2019**, 587-594.
- 2019 **Murthy, A. A.\***; Yasaei, P.\*; Xu, Y.; dos Reis, R.; Shekhawat, G. S.; Dravid, V. P., Spatial Mapping of Hot-Spots across Interfaces in Monolayer Transition Metal Dichalcogenides. *Adv. Mater.*, **2019**, 31, 1808244.
- 2018 Li, Y.; Moy, E. C.; **Murthy, A. A.**; Hao, S.; Cain, J. D.; Hanson, E. D.; DiStefano, J. G.; Chae, W. H.; Li, Q.; Wolverton, C.; Chen, X.; Dravid, V. P., Large-Scale Fabrication of Multilayer MoS<sub>2</sub> Ribbons and Their Thermal Conductivity Study via Temperature-Dependent Raman spectroscopy. *Adv. Funct. Mater.* 28 (13), **2018**, 1704863.
- 2018 **Murthy, A. A.**; Stanev, T. K.; Cain, J. D.; Hao, S.; Wolverton, C.; Stern, N. P.; Dravid, V. P., Intrinsic transport in 2D heterostructures mediated through h-BN tunneling contacts. *Nano Lett.* 18 (5), **2018**, 2990-2998.
- 2018 **Murthy, A. A.\***; Li, Y.\*; Palacios, E.; Li, Q.; Hao, S.; Wolverton, C.; Aydin, K.; Chen, X.; Dravid, V.P., Optically active 1D MoS<sub>2</sub> nano-belts. *ACS App. Mater. Interfaces*. 10 (8), **2018**, 6799-6804.
- 2018 Li, Y.; Hao, S.; DiStefano, J. G.; **Murthy, A. A.**; Hanson, E. D.; Xu, Y.; Wolverton, C.; Chen, X.; Dravid, V.P., Site-Specific Positioning and Patterning of MoS<sub>2</sub> Monolayers - The Role of Au Seeding. *ACS Nano* 12 (9), **2018**, 8970-8976.
- 2018 Li, Y.; Majewski, M. B.; Islam, S. M.; **Murthy, A. A.**; DiStefano, J. G.; Hanson, E. D.; Li, Q.; Kanatzidis, M. G.; Wasielewski, M. R.; Chen, X.; Dravid, V. P., Morphological Engineering of Winged Au@MoS<sub>2</sub> Heterostructures for Electrocatalytic Hydrogen Evolution. *Nano Lett.* 18 (11), **2018**, 7104-7110.

- 2018 DiStefano, J. G.; Li, Y.; Jung, H. J.; Hao, S.; **Murthy, A. A.**; Zhang, X.; Wolverton, C.; Dravid, V.P., Nanoparticle@MoS<sub>2</sub> Core-Shell Architecture: Role of the Core Material. *Chem. Mater.* 30 (14), **2018**, 4675-4682.
- 2018 Islam, S. M., Sangwan, V. K., Li, Y., Kang, J., Zhang, X., He, Y., Zhao, J., **Murthy, A. A.**, Ma, S., Dravid, V. P., Hersam, M. C., Kanatzidis, M. G., Abrupt Thermal Shock of (NH<sub>4</sub>)<sub>2</sub>Mo<sub>3</sub>S<sub>13</sub> Leads to Ultrafast Synthesis of Porous Ensembles of MoS<sub>2</sub> Nanocrystals for High Gain Photodetectors. *ACS App. Mater. Interfaces* 10 (44), **2018**, 38193-38200.
- 2017 Chae, W. H.; Cain, J. D.; Hanson, E. D.; **Murthy, A. A.**; Dravid, V. P., Substrate-Induced Strain and Charge Doping in CVD-Grown Monolayer MoS<sub>2</sub>. *App. Phys. Lett.* 111 (14) **2017**: 143106.
- 2017 Li, Y.; DiStefano, J. G.; **Murthy, A. A.**; Cain, J. D.; Hanson, E. D.; Hao, S.; Li, Q.; Castro, F. C.; Chen, X.; Dravid, V. P., Plasmon-Induced Interfacial Charge-Transfer Transition in Au@MoS<sub>2</sub> Heterostructures for Superior Plasmonic Photodetectors. *ACS Nano* 11 (10), **2017**, 10321-10329.
- 2017 Hanson, E. D.; Lajaunie, L.; Hao, S.; Myers, B. D.; Shi, F.; **Murthy, A. A.**; Wolverton, C.; Arenal, R.; Dravid, V. P., Systematic Study of Oxygen Vacancy Tunable Transport Properties of Few-Layer MoO<sub>3-x</sub> Enabled by Vapor-Based Synthesis. *Adv. Funct. Mater.* 27 (17), **2017**.
- 2016 Li, Y.; Cain, J. D.; Hanson, E. D.; **Murthy, A. A.**; Hao, S.; Shi, F.; Li, Q.; Wolverton, C.; Chen, X.; Dravid, V. P., Au@MoS<sub>2</sub> Core-Shell Heterostructures with Strong Light-Matter Interactions. *Nano Lett.* 16 (12), **2016**, 7696-7702.

\* denotes equal contribution.

## Selected Presentations

- 2021 **Murthy, A. A.**; Checchin, M.; Grassellino, A.; Romanenko, A., Probing Sources of Decoherence at Interfaces in Superconducting Qubit Systems. *MRS talk (EQ18.05)*, Fall 2021, Boston, MA.
- 2020 **Murthy, A. A.**; Understanding Power Dissipation Across Interfaces in 2D Material Systems. *Hilliard Symposium*, May 2020, Evanston, IL, *1st Place Winner*.
- 2019 **Murthy, A. A.**; Yasaei, P.; Xu, Y.; dos Reis, R.; Shekhawat, G. S.; Dravid, V. P., Power dissipation across Interfaces in Monolayer Transition Metal Dichalcogenides. *MRS talk (QN03.01)*, Spring 2019, Phoenix, AZ.
- 2017 **Murthy, A. A.**; Cain, J. D.; Stanev, T. K.; Stern, N. P.; Dravid, V. P., Spatial and Dimensional Confinement: The Case of 2D Chalcogenide Heterostructures. *MRS talk (NT04.02)*, Fall 2017, Boston, MA .

## Leadership

- 2016–2020 **Dravid research group lab safety designate.**  
Ensured that safe laboratory protocols were followed by 40+ graduate students, post-doctoral researchers, and research scientists across 7 laboratories
- 2017–2020 **Graduate research mentor.**  
Mentored and managed 4 undergraduate students in various facets of experimental design and best practices for conducting academic research

## Science Outreach

- 2021–2022 **Materials Research Society, Early Career Subcommittee Volunteer.**  
Helped organize "Meet the New Faculty Candidates" event giving current graduate students and postdoctoral researchers seeking faculty positions the opportunity to speak directly with faculty, recruiters, and department chairs. Also helped organize and prepare a manuscript aimed to help faculty applicants better understand the application review process based on survey responses from both applicants and faculty members.
- 2017–2020 **Materials Science Alliance for Inclusive Community (MatSAIC) seminar organizer.**  
Promoted inclusion and diversity in graduate study within STEM through quarterly seminar series. Invited 6 professors from a wide variety of backgrounds across the country to give talks about their personal career experience.
- 2017–2020 **Science in your Community Center (SICC) Volunteer.**  
Guided underrepresented 6th-8th grade students from Evanston's Fifth Ward through monthly science/engineering challenges.
- 2016–2020 **NUANCE Outreach Volunteer.**  
Conducted numerous instrument demonstrations for several events throughout the year including: Career Day for Girls, "Take Our Daughters & Sons to Work Day", various high school and college lab tours

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## Awards and Honors

- 2019 **Microscopy & Microanalysis Student Scholar Award.**  
Award given to outstanding papers at the Microscopy & Microanalysis meeting
- 2018 **Ryan Fellowship.**  
Fellowship supporting graduate students dedicated to the exploration of nanoscale science and to advancing this knowledge into practical applications of benefit to society

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## Teaching

- Spring 2019 **MSE 360, *Teaching Assistant***, Northwestern University.  
Taught undergraduate students the fundamentals of transmission electron microscopy and scanning electron microscopy through hands-on lab sessions
- Fall 2017 **MSE 190, *Teaching Assistant***, Northwestern University.  
Taught undergraduate students the fundamentals of various characterization instrumentation through lab sessions and grading lab reports

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## Certificate

- 2019 **Management for Scientists and Engineers, *Kellogg School of Management*.**  
Certificate program taught by Kellogg faculty that equips promising post-candidacy doctoral students with the necessary business and leadership skills to succeed in academia and industry.

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## References

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