

Nicholas Domingo Ignacio

Ph.D. Candidate, Science and Engineering Program and Texas Materials Institute
Provost's Early Career Fellow

The University of Texas at Austin, Austin, TX, USA
2501 Speedway
Austin, TX 78712

E-mail: igni@utexas.edu
Web: nignacio.com

Research Interests

- Integration of 2D materials in PCM and RRAM for neuromorphic computing
- Crystalline-crystalline phase transformations for multilevel PCM.
- Electronic transport in low dimensional material devices
- Scanning transmission electron microscopy and scanning tunnelling microscopy (Cryogenic STM superuser at TMI)
- Materials Science pedagogy

Education

- 08/2021 – current:* **Ph.D. Candidate** (advisor Prof. Deji Akinwande) Materials Science and Engineering Program and Texas Materials Institute, University of Texas at Austin, Austin, USA
- 01/2020 – 06/2020:* **Visiting Student through Materials Exchange Program**, University of Oxford, Oxford, UK
- 08/2017 – 06/2021:* **S.B. Materials Science and Engineering**, Massachusetts Institute of Technology, Cambridge, USA

Awards, Honors & Certificates

- 05/2024:* **2024 Provost's Early Career Fellow**, University of Texas at Austin, Office of the Executive Vice President and Provost
- 09/2023:* **Science Graduate Student Research (SCGSR) Fellowship**, U.S. Department of Energy, hosted by Oak Ridge National Lab, Center of Nanophase Materials Science, Scanning Tunneling Microscopy Group
- 12/2022:* **Professional Development Award**, University of Texas at Austin
- 08/2021:* **Virginia and Ernest Cockrell, Jr. Fellow**, University of Texas at Austin
- 08/2021:* **T. W. Whaley, Jr. Scholarship**, University of Texas at Austin

Professional Activities

Publications

- In Preparation:** **N. D. Ignacio**, M. S. Hus, X. Zhan, C. Nelson, A.-P. Li, D. Akinwande, Layer-by-layer phase change in an In₂Se₃ based neuromorphic device
- N. D. Ignacio**, M. S. Hus, L. Li, J. Fatheema, L. Liang, SA.-P. Li, D. Akinwande, Impact of defects and electrode interfaces on resistive switching in hBN/Ag memristors
- N. D. Ignacio***, N. Stern*, G. Coloyan-Fleming, Promoting Graduate Engineering Communities and Sense of Job Satisfaction through Curating Department-Specific Teaching Assistant Support Programs
- Prepress:** S. Kutagulla, M. Coupin, D. Mutyala, C. Favela, **N. D. Ignacio**, N. H. Le, I. Terry, C. Bohn, J. Warner, N. Aluru, B. Korgel, D. Akiwnande, Ozonated monolayer graphene for extended performance and durability in hydrogen fuel cell electric vehicles *Adv Mater* (2024) In Review
- M. Floto*, **N. D. Ignacio***, R. Ciufu, D. Akinwande, C.B. Mullins, Hydrogen-Induced Surface Reconstruction of Co(poly) Studied by STM *Phys. Chem. Chem. Phys* (2024) In Review
- Y. Jeon, D. Kim, C. Biswas, **N. D. Ignacio**, S. Feng, K Lai, D.-H. Kim, D. Akinwande, Enhanced Synaptic Memory Window and Linearity in Planar In₂Se₃ Ferroelectric Junctions *Adv Mater* (2024) In Review
- Published:** Y. Lee, Y. Hunag, Y.-F. Chang, S. J. Yang, **N.D. Ignacio**, S. Kutagulla, S. Mohan, S. Kim, J. Lee, D. Akinwande, S. Kim, Programmable Retention Characteristics in MoS₂-Based Atomirsotrs for Neuromorphic and Reservoir computing Systems, *ACS Nano* (2024)
- J. Xie, Md. Patoary, R. Laskar, Md. A. Rahman Laskar, **N. D. Ignacio**, X. Zhan, U. Celano, D. Akinwande, I. Sanchez Esqueda, Quantum conductance in vertical hexagonal boron nitride memristors with graphene-edge contacts, *ACS Nano Lett.* (2024)
- N. D. Ignacio**, J. Fatheema, Y. Jeon, D. Akinwande, Air-stable atomically encapsulated crystalline-crystalline phase transitions in In₂Se₃, *Adv Elec Matr* (2023)
- S. Mohan, D. Kireev, S. Kutagulla, **N. D. Ignacio**, Y. Gu, H. Celio, X. Zun, D. Akinwande, K. Liechti, Direct, Metal-free Growth and Dry

Separation of Bilayer Graphene on Sapphire: Implications for Electronic Applications, *ACS Appl. Nano Mater* (2023)

Y. Huang*, Y. Gu*, S. Mohan, A. Dolocan, **N. D. Ignacio**, S. Kutagulla, K. Matthews, A. Londoño-Calderon, Y.-F Chang, Y.-C. Chen, J. Warner, M.T. Pettes, J.C. Lee, D. Akinwande, Reliability improvement and effective switching model of thin-film MoS₂ memristors, *Adv Funct Mater* (2023)

* Denotes equal contribution

Conferences

Presentations

- 12/2024: **“Switching in Atomic Memristors: The Role of Defects and Interface”**, Materials Research Society (MRS) Fall 2024 Meeting, (Boston, Ma, USA)
- 12/2024: **“Layer-By-Layer Phase Change in an In₂Se₃-Based Neuromorphic Device”**, Materials Research Society (MRS) Fall 2024 Meeting, (Boston, Ma, USA)

Posters

- 11/2023: **“Structural Phase Transitions for Multi-Level In₂Se₃ Based Phase Change Memory”**, Materials Research Society (MRS) Fall 2023 Meeting, (Boston, Ma, USA)
- 11/2022: **“Control of Crystalline-Crystalline Phase Changes in In₂Se₃ by Encapsulation”**, Materials Research Society (MRS) Fall 2022 Meeting, (Boston, Ma, USA)
- 06/2022: **“Hydrogen-Induced Surface Reconstruction of Co(poly) Studied by STM”**, 82nd PEC Meeting 2022, (Chicago, IL, USA)

Member

American Chemical Society (ACS)
American Society of Mechanical Engineers (ASME)
Materials Research Society (MRS)

American Physics Society (APS)

Teaching Experience

- 08/2024 – 12/2024:* **Graduate Instructor**, Experiments in Materials Science & Engineering (MSE360M), Dept. of Mechanical Engineering, UT Austin, Dr. Derek Davies
- 01/2023 – 05/2023:* **Teaching Assistant/Supplementary Instruction Leader**, Introduction to Astronomy (AST301), Dept. of Astronomy, UT Austin, Prof. Paul Shapiro
- 05/2022 – 08/2022:* **Teaching Assistant**, Materials Engineering (ME334), Dept. of Mechanical Engineering, UT Austin, Dr. Jeremiah McCallister
- 09/2019 – 12/2019:* **Teaching Assistant/Recitation Leader**, Introduction to Solid State Chemistry (3.091), MIT, Prof. Jeff Grossman

Pedagogical Training

- 08/2022 – 12/2024:* **Graduate Certificate in Engineering Education**, Cockrell School of Engineering, UT Austin
- 08/2023 – 12/2023:* **Teaching Preparation Certificate**, Center for Teaching and Learning, UT Austin
- 06/2023:* **Inclusive Classrooms Leadership**, Division of Diversity and Community Engagement, UT Austin
- 02/2023:* **K-12 Outreach Certificate**, CDCM MRSEC, University of Texas at Austin

Mentoring Experience

- 2023:* Ikel Hernandez, REU at UT Austin, Texas State University (current: graduate student, Drexel University)

Service & Outreach

- Reviewer for:* ACS Nano, Journal of Emerging Investigators
(2023 – current)
- 08/2023 – current:* UT Austin Materials Research Society President
- 08/2023 – current:* UT Austin Graduate Engineering Council Financial Director
- 08/2023 – current:* UT Austin Graduate Student Assembly Materials Science representative
- 09/2022 – 09/2023:* Cockrell School of Engineering DEI board member
- 02/2022 – current:* K-12 STEM outreach through UT MRSEC in local elementary schools
- 08/2021 – current:* MIT Education Councilor (Interview prospective undergraduates)
- 08/2020 – 06/2022:* MIT First year associate advisor
- 08/2020 – 06/2022:* MIT Undergraduate associate advising steering committee member
- 06/2020 – 06/2022:* Department Representative on DEI board of MIT Undergraduate Association
- 08/2020 – 06/2021:* Vice President of Society of Undergraduate Materials Scientists at MIT

08/2018 – 08/2021: Department of Materials Science Freshmen Pre-orientation program mentor and coordinator

Professional Experience

08/2020 – 07/2021: **SLS Materials Engineer**, Formlabs

06/2019 – 08/2019: **Low Observable Materials Intern**, Lockheed Martin Skunkworks

01/2019: **Low Observable Materials Intern**, Lockheed Martin Skunkworks

References

Dr. Deji Akinwande

Department of Electrical and Computer Engineering

The University of Texas at Austin

Austin, TX, 78758

Tel: (512) 471-4345

Email: deji@ece.utexas.edu

Dr. Saban Hus

CNMS Scanning Probe Microscopy Group

Oak Ridge National Laboratory

P.O. Box 2008

Oak Ridge, TN 37831-6506

Tel: (865) 951-8517

Email: hussm@ornl.gov

Dr. Jamie Warner

Texas Materials Institute

The University of Texas at Austin

Austin, TX, 78758

Email: jamie.warner@austin.utexas.edu

Dr. Maura Borrego

Center for Engineering Education

The University of Texas at Austin

Austin, TX, 78758

Tel: (512) 471-3083

Email: maura.borrego@austin.utexas.edu

Dr. Gabriella Coloyan Fleming

Engineering Education

Virginia Tech

Blacksburg, VA, 24061

Tel: (617) 680-5863

Email: gabriellaf@vt.edu