

Nicholas Domingo Ignacio

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

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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)
- Engineering 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

- 12/2024:* **Professional Development Award**, University of Texas at Austin
- 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. Akinwande, 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. Ciufo, D. Akinwande, C.B. Mullins, Hydrogen-Induced Surface Reconstruction of Co(poly) Studied by STM *Phys. Chem. Chem. Phys* (2024) **In Review**
- Published:** Y. Jeon, D. Kim, C. Biswas, **N. D. Ignacio**, P. Carmichael, S. Feng, K. Lai, D.-H. Kim, D. Akinwande, Enhanced Synaptic Memory Window and Linearity in Planar In₂Se₃ Ferroelectric Junctions *Adv Mater* (2024)
- 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 Atomistic Reservoirs 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: **“Defects and interfaces in atomristors: a study of a hexagonal boron nitride device”**, Materials Research Society (MRS) Fall 2024 Meeting, (Boston, Ma, USA)

12/2024: **“Multi-step resistance switching by crystalline-crystalline phase changes in In₂Se₃”**, 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

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