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](mailto:igni@utexas.edu)

Web: [nignacio.com](file:///Users/nickignacio/Desktop/website/docs/nickignacio.github.io)

**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. 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. 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 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

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| *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

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| *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*](mailto: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*](mailto:maura.borrego@austin.utexas.edu)

**Dr. Gabriella Coloyan Fleming**

*Engineering Education*

*Virginia Tech*

*Blacksburg, VA, 24061*

*Tel: (617) 680-5863*

*Email:* [*gabriellaf@vt.edu*](mailto:gabriellaf@vt.edu)

Last Updated January 2025