

# 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](http://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
- 02/2023:*                 **K-12 Outreach Certificate**, CDCM MRSEC, University of Texas at Austin
- 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 In<sub>2</sub>Se<sub>3</sub> 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**
- 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 In<sub>2</sub>Se<sub>3</sub> 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 MoS<sub>2</sub>-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 In<sub>2</sub>Se<sub>3</sub>, *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 MoS<sub>2</sub> 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)
- 11/2023:** **“Layer-By-Layer Phase Change in an In<sub>2</sub>Se<sub>3</sub>-Based Neuromorphic Device”**, Materials Research Society (MRS) Fall 2024 Meeting, (Boston, Ma, USA)

### Posters

- 11/2023:** **“Structural Phase Transitions for Multi-Level In<sub>2</sub>Se<sub>3</sub> Based Phase Change Memory”**, Materials Research Society (MRS) Fall 2023 Meeting, (Boston, Ma, USA)
- 11/2022:** **“Control of Crystalline-Crystalline Phase Changes in In<sub>2</sub>Se<sub>3</sub> by Encapsulation”**, Materials Research Society (MRS) Fall 2022 Meeting, (Boston, Ma, USA)
- 06/2022:** **“Hydrogen-Induced Surface Reconstruction of Co(poly) Studied by STM”**, 82<sup>nd</sup> 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

## 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](mailto: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](mailto: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)*

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