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. 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 In_2Se_3, *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_2 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 In_2Se_3",** 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: (2023 – current) ACS Nano, Journal of Emerging Investigators

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