

Matthew S. Rahn

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EDUCATION

M.S. in Materials Science and Engineering

Northwestern University

Graduated: 2022

Evanston, IL

B.S. in Materials Science and Engineering

The Pennsylvania State University, Schreyer Honors College (summa cum laude)

Graduated: 2016

State College, PA

WORK EXPERIENCE

Intel Corporation

Module Development Engineer

2022 – present

Hillsboro, OR

- ◇ Led installation and process qualification of two first of a kind plasma enhanced chemical vapor deposition tools: Tokyo Electron Triase⁺ and Tokyo Electron Episode 1 platforms
- ◇ Collaborated with focus teams to develop process recipes resulting in increased device performance (+1%) and improved tool efficiency (-1 process chamber)
- ◇ Designed and set up module support systems, including process flow control, test wafers, and metrology events
- ◇ Implemented automatic utilities for lot disposition, inline monitoring, shift passdown, and wafermap defect mode identification (>120 hr/wk saved)

RESEARCH EXPERIENCE

Northwestern University

Researcher, Hersam Group

2016 – 2022

Evanston, IL

- ◇ Characterized two-dimensional materials (borophene, epitaxial graphene, self-assembled molecules) using ultra-high vacuum scanning tunneling microscopy (+4 publications)
- ◇ Expanded the capabilities of five custom-built ultra-high vacuum systems, adding capacity for characterization (scanning tunneling microscopy, qPlus atomic force microscopy) and in-situ growth (electron beam deposition, sputtering, gas functionalization)
- ◇ Acted as equipment superuser for Asylum Instruments Cypher atomic force microscope; developed new instrumental techniques for users including lateral force microscopy, nanopatterning, and use of an inert gas cell to characterize ambient-reactive materials
- ◇ Automated and implemented alerts for laboratory processes such as thermal annealing, e-beam operation, and cryostat temperature/level monitoring (>200 hr/yr saved)
- ◇ Served as a teaching assistant for two graduate level solid state physics courses: MSE 451 Physics of Materials (fall 2018) and MSE 405 Physics of Solids (spring 2020, 2021)

The Pennsylvania State University

Research Assistant, Engel-Herbert Group

2014 – 2016

State College, PA

The University of New South Wales

Research Assistant, IRES program

Q3 2015

Sydney, Australia

North Carolina State University

Research Assistant, Ivanisevic Group

Q3 2014

Raleigh, NC

TECHNICAL SKILLS

Computing: Python, SQL, MATLAB, Git, JMP, SolidWorks (CAD/CAM), Blender, L^AT_EX

Fabrication: Milling, turning, grinding, additive manufacturing (FDM, MSLA), welding (TIG, stick), electrical discharge machining, design and construction of ultra-high vacuum compatible components and assemblies

Metrology: Scanning tunneling microscopy/spectroscopy, atomic force microscopy (contact/non-contact, CAFM, LFM), scanning electron microscopy, Raman spectroscopy, X-ray photoelectron spectroscopy, thermogravimetric analysis, residual gas analysis, energy-dispersive X-ray spectroscopy, secondary ion mass spectroscopy

AWARDS, HONORS & FELLOWSHIPS

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| Logic Technology Development (LTD) Divisional Recognition Award | Q2 2024 |
| ◊ For independent development of an automatic passdown system for the XCT, TIF, WDP, and LAK modules | |
| LTD Department Recognition Award | Q1 2024 |
| ◊ For group recipe development leading to Intel 18A performance and yield improvements | |
| LTD Area Recognition Award | Q1 2024 |
| ◊ For independent development of a wafermap defect mode library for the XCT and WDP modules | |
| LTD Area Recognition Award | Q1 2023 |
| ◊ For independent development of an automatic check out lot disposition system for the XCT module | |
| National Science Foundation Graduate Research Fellowship, Honorable Mention | 2018 |
| Hierarchical Materials Cluster Program Fellowship | 2017 |
| Matthew J. Wilson Honors Scholarship | 2015 - 2016 |
| Greskovich Scholarship | 2015 - 2016 |
| Mcfarlane Scholarship | 2015 - 2016 |
| First Place Winner, Materials Design Competition | 2015 |
| Helen and Van Leichliter Scholarship | 2014 - 2015 |
| John and Elizabeth Holmes Teas Scholarship | 2013 - 2015 |
| Anthony J. and Alberta L. Perotta Scholarship | 2012 - 2013 |
| President's Freshman Award | 2013 |

PUBLICATIONS

- E. B. Aklile, X. Liu, D. P. Goronzy, **M. S. Rahn**, Q. Li, C. Lamarca, and M. C. Hersam. Achieving ambient stability of borophene via ultrahigh vacuum alumina. *ACS Nano Letters*, (submitted)
- X. Liu, **M. S. Rahn**, Q. Ruan, B. I. Yakobson, and M. C. Hersam. Probing borophene oxidation at the atomic scale. *Nanotechnology*, 33, 2022
- X. Liu, Q. Li, Q. Ruan, **M. S. Rahn**, B. I. Yakobson, and M. C. Hersam. Borophene synthesis beyond the single-atomic-layer limit. *Nature Materials*, 21:35–40, 2022
- Q. Li, V. S. C. Kolluru, **M. S. Rahn**, E. Schwenker, S. Li, R. G. Hennig, P. Darancet, M. K. Y. Chan, and M. C. Hersam. Synthesis of borophane polymorphs through hydrogenation of borophene. *Science*, 371:1143, 2021
- A. M. Evans, A. Giri, V. K. Sangwan, S. Xun, M. Bartnof, C. G. Torres-Castanedo, H. B. Balch, **M. S. Rahn**, N. P. Bradshaw, E. Vitaku, D. W. Burke, H. Li, M. J. Bedzyk, F. Wang, J.-L. Brédas, J. A. Malen, A. J. H. McGaughey, M. C. Hersam, W. R. Dichtel, and P. E. Hopkins. Thermally conductive ultra-low-k dielectric layers based on two-dimensional covalent organic frameworks. *Nature Materials*, 20:1142–1148, 2021
- S. Li, C. Zhong, A. Henning, V. K. Sangwan, Q. Zhou, X. Liu, **M. S. Rahn**, S. A. Wells, H. Y. Park, J. Luxa, Z. Sofer, A. Facchetti, P. Darancet, T. J. Marks, L. J. Lauhon, E. A. Weiss, and M. C. Hersam. Molecular-scale characterization of photoinduced charge separation in mixed-dimensional inorganic-organic van der Waals heterostructures. *ACS Nano*, 14:3509–3518, 2020
- X. Liu, L. Wang, S. Li, **M. S. Rahn**, B. I. Yakobson, and M. C. Hersam. Geometric imaging of borophene polymorphs with functionalized probes. *Nature Communications*, 10:1642, 2019
- B. L. Pearce, N. G. Berg, **M. S. Rahn**, and A. Ivanisevic. In situ and ex situ functionalization of nanostructured gallium oxy-hydroxide with a porphyrin dye. *Scanning*, 38:671–683, 2016
- B. L. Pearce, S. J. Wilkins, **M. S. Rahn**, and A. Ivanisevic. In situ functionalization of gallium nitride powder with a porphyrin dye. *Journal of Materials Research*, 30:2910–2918, 2015
- A. Golas, H. Pitakjakkpipop, **M. S. Rahn**, C. A. Siedlecki, and E. A. Vogler. Enzymes produced by autoactivation of blood factor xii in buffer: A contribution from the hematology at biomaterial interfaces research group. *Biomaterials*, 37:1–12, 2015