MATTHEW COUPIN

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ABOUT

Materials Science PhD with expertise in nanomaterials synthesis and characterization, with an emphasis on high-resolution transmission electron microscopy and spectroscopy

Education

University of Texas at Austin — **2020 - 2025**
PhD in Materials Science & Engineering — GPA: 3.9 / 4.0

Massachusetts Institute of Technology — **Class of 2018**
S.B. in Materials Science & Engineering — GPA: 4.6 / 5.0

Dissertation

Quantitative Multiscale Methods for Scanning Transmission Electron Microscopy of Low-Dimensional Materials in Two and Three Dimensions.

Scanning transmission electron microscopy (STEM) and electron energy loss spectroscopy (EELS) were used to extract quantitative 3-dimensional measurements of material structure, electronic properties, and mass density.

Advisor: Jamie H. Warner, Director, Texas Materials Institute

Publications *(* = First or co-first author)*

***** 3D Atomic Scale Insights into Unconventional Fragmentation of 2D ReS2 Monolayers into Molecular Clusters	*Under Review*
***** Quantitative Nanoscale Structure Determination in Polyamide Desalination Membranes by Correlated Electron Tomography and Spectroscopy	**ACS Nano 2026**
Ozonated Monolayer Graphene for Extended Performance and Durability in Hydrogen Fuel Cell Electric Vehicles	**ACS Nano 2025**
Scalable Bottom-Up Synthesis of Nanoporous Hexagonal Boron Nitride (h-BN) for Large-Area Atomically Thin Ceramic Membranes	**Nano Letters 2025**
Protein-Enabled Size-Selective Defect-Sealing of Atomically Thin 2D Membranes for Dialysis and Nanoscale Separations	**Nano Letters 2024**
Low-Temperature Synthesis of WSe2 by the Selenization Process under Ultrahigh Vacuum for BEOL Compatible Reconfigurable Neurons	**ACS App. Mat. & Interf. 2024**
Ultra-fast switching memristors based on two-dimensional materials	**Nature Communications 2024**
***** Moiré Superlattice Structure of Pleated Trilayer Graphene Imaged by 4D Scanning Transmission Electron Microscopy	**ACS Nano 2023**
***** Mapping Nanoscale Electrostatic Field Fluctuations Around Graphene Dislocation Cores Using 4D-STEM	**Nano Letters 2023**
Self-Compliant Threshold Switching Devices with High On/Off ratio by Control of Quantized Conductance in Ag Filaments	**Nano Letters 2023**
Lattice-Mismatch-Driven Small-Angle Moiré Twists in Epitaxially Grown 2D Vertical Layered Heterostructures	**Advanced Materials 2022**
Phase Engineering of Palladium Selenide Using Chalcogen Flux Control	**Chemistry of Materials 2022**
Atomic-Scale Insights into the Lateral and Vertical Epitaxial Growth in Two-Dimensional Pd_2Se_3-MoS_2 Heterostructures	**ACS Nano 2022**
***** Mapping 1D Confined Electromagnetic Edge States in 2D Monolayer Semiconducting MoS_2 Using 4D-STEM	**ACS Nano 2022**

References

For references, please contact:

Professor Jamie H. Warner (jamie.warner@austin.utexas.edu) Texas Materials Institute, UT Austin

Professor Piran Kidambi (p.kidambi@ufl.edu), Mechanical and Aerospace Engineering, University of Florida

Work Experience

Materials Engineer - Product Design - Apple Inc. **September 2018 - October 2019**

Supported development of alloys, cosmetic coatings, battery materials, and thermal materials for Apple products. Role centered around materials R&D, failure analysis, corrosion science, and test fixture design.

Summer Researcher - Materialprüfungsanstalt, University of Stuttgart **May - August 2018**

Implemented custom strain-hardening subroutines for friction stir welding simulations in Abaqus FEA.

Manufacturing Engineering Intern - Tesla Motors **May - August 2017**

Process & industrial engineering for general assembly & paint lines at Tesla's factory.

Chemistry, Manufacturing, and Controls Intern - Teva Pharmaceuticals **May - August 2016**

Worked on formulation development and rheology of a drug in pre-clinical development.

Software Developer Intern - WGT Media **May - August 2014**

Worked with programmers and project managers to improve WGT mobile products.

Miscellaneous

MIT Burchard Scholar **2016 - 2017 Academic Year**

Recognized as an outstanding student in the humanities, arts, or social sciences.

Eagle Scout

Fundraised, secured permits, and sought volunteers for a community service project which benefited a local pre-school.

SKILLS & INTERESTS

Skills: HRTEM & 4D-STEM simulation, numerical computing & data science in a Python environment, TEM sample preparation, SerialEM scripting, SPA with RELION, FIB-SEM, EBSD, Machining, MCAD, Abaqus FEA

Hobbies & Interests: Skiing, backpacking, running, enduro motorcycles, geography, Spanish language