

Shan Kutagulla

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EDUCATION

University of Texas at Austin, Cockrell School of Engineering

Austin, TX

PhD in Materials Science and Engineering

Honors: Cockrell School of Engineering (CSoE) Fellowship, Samsung Fellowship (x2)

University of Southern California, Viterbi School of Engineering

Los Angeles, CA

Master of Science in Materials Engineering

Bachelor of Science in Chemical Engineering

Honors: Presidential Scholarship (half-tuition merit based), Dean's List

WORK EXPERIENCE

Kepler Computing

San Jose, CA

Senior Process Scientist/Technical Lead

August 2026-Present

- Lead team of 3 to develop novel ferroelectric memory stacks with PVD deposition for process scale up from PLD

Lam Research

Fremont, CA

Process Development Engineer, Tungsten & Molybdenum Metallization

June 2025-August 2026

- Improved tungsten nitride deposition process robustness by identifying ALD saturation regime, increasing temperature tolerance ~20% and improving tool throughput ~10%.
- Re-developed a critical metallization layer on 3 nm process to reduce voiding by 96%, reduced particle impact by 47% and improved fill performance without affecting throughput.
- Developed virtual sensor monitoring system (SPC) detecting plasma instability and precursor dosing issues (via Cp/Cpk) across multiple deposition chambers, improving machine uptime by ~6% on 7 nm process. Implemented equipment intelligence to detect arcing and process excursions, improving tool reliability and reducing unscheduled downtime.
- Led development of new plasma pre-clean process and hardware modifications (generator, matching network) enabling improved process uniformity and reduced defectivity. Development process was awarded a breakout session (60/1200+ applications) at Lam's Engineering Technology Conference and a Director's Award.

Transition Ventures

London, UK

Technical Advisor (former PhD Fellow)

November 2024-Present

- Developed investment roadmap and deep tech sourcing for semiconductor and energy investments (contributing to investment in Flux Computing, Abacus Power, Anthro Energy, Seneca)
- Led deep dives on photonics (optical transceiver components and market, EAM/EML innovations, photodiodes, challenges moving to InP platforms), grid innovations (solid state transformers, SiC), and power electronics (mapped generation to use into a data center, elimination of the 12V intermediate bus)

Intel

Portland, OR

Components Research Intern- CMP

May 2024-August 2024

- Developed predictive model for oxide CMP through experimental data collection, materials characterization and machine learning modeling. Under NDA except for publicly released presentation and paper.
- Paper accepted for conference talk (NCCAVS CMP User Group)

Canon Nanotechnologies

Austin, TX

Process Research and Development Applications Intern

May 2023-August 2023

- Developed nondestructive imaging technique for micron-scale sidewalls of nanoimprint masks using optical (Nikon SMZ25, Keyence VHX-650) & confocal microscopy (Olympus LEXT, Keyence VK-X1100)
- Optimized sputtered thicknesses of iridium through calibration curves measured by atomic force microscopy and ellipsometry for imaging polymer and glass substrate samples for AR/VR and meta-optical lens products
- Analyzed process variability of 300 mm nanoimprinted glass-substrate wafers for VR/AR applications by atomic force microscopy (Bruker Dimension Icon AFM) and scanning electron microscopy (Hitachi SU-8100)

Samsung Austin Semiconductor*Process Integration Engineer- 14nm RF*

Austin, TX

January 2021 – August 2021

- Led yield improvement projects to reduce defectivity in BEOL Cu and Al films, leading to 2% increase in edge yield for 14 nm RF chips
- Supported 14 nm FinFET chip integration, monitoring and applying corrections in process flow to compensate for electrical testing (ET) data trends
- Saved \$15M in wafer/die recovery efforts to prevent unnecessary scrap after major fab event in February 2021 leading to Individual Spotlight Award and Director's Awards (Q1/Q2)

University of Texas at Austin, Cockrell School of Engineering*Graduate Research Assistant, Akinwande Nano Research Group*

Austin, TX

August 2021-April 2025

- Depositions expert- led AIXTRON MOCVD tool purchase, qualification and process development (hBN, MoS₂, MoSe₂) at the JJ Pickle Research Center. Led vendor management to develop in-situ Raman tool for C-BN hybrid monitoring with vendors (Nanomaster and Bruker).
- Developed 27% more durable and 50% lower parasitic hydrogen crossover fuel cell membranes by integrating defect engineered, CVD grown 2D materials into proton exchange fuel cell (PEMFC) membranes published in *ACS Nano*
- Developed first demonstration of MoS₂ proton conduction and expanded library of 2D proton conduction films, published in *ACS Applied Materials & Interfaces*
- Materials and process development for molybdenum disulfide/diselenide for memristor applications, basic device testing and characterization published in *ACS Nano & ACS Applied Materials & Interfaces*
- Developed low temperature 2D material growth & fabrication schemes to test 2D material biocompatibility and wrote review article in *Nature Reviews Materials*

JSR Micro, Inc.*Research and Development Engineering Intern (EUV Lithography Team)*

Sunnyvale, CA

June 2020 – August 2020

- Developed model for k4 photoresist metric, confirmed proof of concept and built VBA application for resist comparison
- Created and optimized metrology recipe for Hitachi CD SEM Metrology tool and developed scripts for power spectral density (PSD) analysis of exposed line space patterning on EUV resists
- Identified key PSD parameters correlating with line width roughness measurement (LWR) for prediction of resist performance
- Performed Gage R&R study on SuMMIT PSD data against Hitachi SEM Metrology tool and presented data to leadership

Samsung Austin Semiconductor*Metal Ops Process Engineering Intern*

Austin, TX

May 2019 – August 2019

- Created an EDX spectra catalog of components within a wafer processing environment with Excel and VBA scripting enabling accurate defect sourcing, improving tool restart time, decreasing stop loss, and improving yield
- Automated post preventative maintenance testing through use of proprietary image recognition software on AMAT tools, saving 1.5 man-hours per test, reducing downtime and minimizing human error
- Built web-app to sort, retrieve and manipulate tool data through use of Python, HTML, SQL and JavaScript, compressing weeks of manual data sorting and entry into an average of 8 minutes per year of data
- Discovered relationship between number of defects and equipment specifications using JMP analysis with over 85% confidence and presented recommendations for further monitoring for future revision of specification limits

JSR Micro, Inc.*Research and Development Engineering Intern*

Sunnyvale, CA

May 2018 – August 2018

- Qualified newly acquired J.A. Woollam ellipsometer for active use by resolved differences between ellipsometer and reflectometer-based thin film analysis in cleanroom environment. Presented summary and report to R&D team.
- Created database of nearly fifty types of materials and their fits commonly used at JSR, which can fit hundreds of similar resist and underlayer materials

- Optimized extreme ultraviolet resist (EUV) process conditions through data analysis with JMP and quartz-crystal microbalance (QCM) experiments to maximize customer throughput
- Characterized dielectric and optical properties of thin films on wafers with an ellipsometer, reflectometer, quartz-crystal microbalance, SEM and exposure tools

TECHNICAL & PROFESSIONAL SKILLS

Lab Skills

- Materials Characterization: SEM/X-SEM, Energy Dispersive Spectroscopy (EDS/EDX), Atomic Force Microscopy (AFM), X-Ray Diffraction (XRD), Goniometry & Contact Angle Measurements, Quartz Crystal Microbalance (QCM), Ellipsometry, Reflectometry, Raman, Optical + Confocal Microscopy, X-Ray Photoelectron Spectroscopy (XPS), Total reflection X-Ray Fluorescence (TXRF), Fourier Transform Infrared Spectroscopy (FTIR)
- Equipment: Scanners & Steppers, Vacuum pumps (roughing, rotary, turbomolecular, cryogenic, HPLC), Class 3B/4 lasers + optics
- Electrical Testing: Source Measurement Units (SMU)/Pulse Measurement Unit (PMU), Cascade Test Stage
- Electrochemical Testing: Arbin Battery Cyclers, Admiral Instruments Potentiostats & Cyclers, Scribner Fuel Cell Test Station

Software

- Statistical Analyses/SPC: JMP, Origin, Microsoft Office
- Business Analytics: TIBCO Spotfire
- Coding Languages: Python, MATLAB, Java, VBA, SQL
- Data Analysis/Visualization Techniques: Python (scikit-learn, pandas) Linear/Logistic Regression, Cluster Analyses, Principal Component Analysis (PCA), Tableau, TIBCO Spotfire, Excel, Git

Design / Soft Skills

- Semiconductor process design: Oxidation, Lithography, Etch and Cleans process design, TCAD
- Analysis Techniques: Design of Experiments (DOE)
- Team management, leadership & communication in technical environments

PUBLICATIONS

14. Jayanth RT, White N, Kireev D, Serna M, **Kutagulla S**, Okogbue E, Jung Y, Sakiyama-Elbert S, Akinwande D. Biocompatibility of Large Area Electronics-Grade 2D Materials With Stem Cells and Motor Neurons. (2026) *Cell Reports Physical Science*. Accepted.
13. **Kutagulla S***, Carmicheal P*, Biswas A, Mutayala D, Terlier T, Le NH, Caldino Bohn I, Favela CS, Vajtai R, Korgel BA, Aluru N, Ajayan P, Akinwande D. Nanocrystalline Boron Nitride Coating for High Conductivity, Low Temperature Proton Exchange Membrane Fuel Cells. (2025) *ACS Nano*. DOI: 10.1021/acsnano.5c17368.
12. **Kutagulla S**, King D, Carmichael P, Misra U, Kumar M, Akinwande D. Monolayer Graphene Enhances OH⁻/HCO₃⁻ Selectivity in Anion Exchange Membranes. (2025) *MRS Bulletin*. DOI: 10.1557/s43577-025-00961-4.
11. **Kutagulla S**, Carmichael P, Coupin M, Mutyala D, Ignacio ND, Le NH, Caldino-Bohn IT, Kim JW, Mason KS, Warner J, Aluru N, Korgel BA, Page ZA, Akinwande D. (2025) Ozonated monolayer graphene for extended performance and durability in hydrogen fuel cell electric vehicles. *ACS Nano*. DOI: 10.1021/acsnano.5c02055
10. Yang SJ, Jeon YR, Mohan S, **Kutagulla S**, Disiena M, Bannerjee SK, Akinwande D, (2025) Giant Memory Window Performance and Low Power Consumption of Hexagonal Boron Nitride Monolayer Atomristor. *npj 2D Materials & Applications*. DOI: 10.1038/s41699-025-00533-9
9. Kireev D, **Kutagulla S**, Hong J, Wilson M, Ramezani M, Kuzum D, Anh JH, Akinwande D. (2024) Atomically Thin Bioelectronics: A Perspective. *Nature Reviews Materials*. DOI: 10.1038/s41578-024-00728-4
8. Lee Y, Huang Y, Chang YF, Yang SJ, Ignacio N, **Kutagulla S**, Mohan S, Kim S, Lee J, Akinwande D, Kim S. (2024) Programmable Retention Characteristics in MoS₂-Based Atomristors for Neuromorphic and Reservoir computing Systems. *ACS Nano*. DOI: 10.1021/acsnano.4c00333
7. Yang SJ, Liang L, Lee Y, Gu Y, Fatheema J, **Kutagulla S**, Kim D, Kim M, Kim S, Akinwande D. (2024) Volatile and

Nonvolatile Resistive Switching in Conductive Point Hexagonal Boron Nitride. *ACS Nano*. DOI: 10.1021/acsnano.3c10068

6. **Kutagulla S**, Le NH, Caldino-Bohn IT, Stacy BJ, Favela CS, Slack JJ, Baker AM, Kim H, Shin HS, Korgel BA, Akinwande D. (2023) Comparative Studies of Atomically Thin Proton Conductive Films to Reduce Crossover in Hydrogen Fuel Cells. *ACS Applied Materials & Interfaces*. DOI: 10.1021/acsami.3c12650

5. Mohan S, Kireev D, **Kutagulla S**, Ignacio N, Gu Y, Celio H, Zhan X, Akinwande D, Leichti K. (2023) Direct, Metal-free Growth and Dry Transfer of Bilayer Graphene on Sapphire. *ACS Applied Nano Materials*. DOI: 10.1021/acsanm.3c03533

4. Huang, Y., Gu, Y., Mohan, S., Dolocan, A., Ignacio, N. D., **Kutagulla, S.**, Matthews, K., Londoño-Calderon, A., Chang, Y.-F., Chen, Y.-C., Warner, J. H., Pettes, M. T., Lee, J. C., Akinwande, D., Reliability Improvement and Effective Switching Layer Model of Thin-Film MoS₂ Memristors. *Advanced Functional Materials*. 2023, 2214250. DOI: 10.1002/adfm.202214250

3. Fatima, S., Gu, Y., Yang, S. J., **Kutagulla, S.**, Rizwan, S., & Akinwande, D. (2023). Comparative Study between Sulfurized MoS₂ from Molybdenum and Molybdenum Trioxide Precursors for Thin-Film Device Applications. *ACS Applied Materials & Interfaces*. DOI: 10.1021/acsami.3c00824

2. Orvis T, Kumarasubramanian H, Surendran M, **Kutagulla S**, Cunniff A, Ravichandran J. (2021) In situ Monitoring of Composition and Sensitivity to Growth Parameters of Pulsed Laser Deposition. *ACS Applied Electronic Materials*. DOI: 10.1021/acsaelm.1c00024

1. Kumar G, Roy A, McMullen RS, **Kutagulla S**, Bradforth SE. (2018) The influence of aqueous solvent on the electronic structure and non-adiabatic dynamics of indole explored by liquid-jet photoelectron spectroscopy. *Faraday Discussions*. DOI: 10.1039/c8fd00123e

AWARDS

Lam Engineering Technology Conference 2026 Breakout Presentation Selection	February 2026
Lam Director's Spotlight Award (Direct Metals)	November 2025
Samsung Fellowship	January 2025
Outstanding Intern, Technology Development- Intel	July 2024
Student Employee of the Year- ATI	March 2024
Samsung Fellowship	January 2024
ENFL STA Grant Finalist (Top 20 Abstracts)- American Chemical Society	August 2023
Honorable Mention – NSF Graduate Research Fellowship Program (GRFP)	April 2022
Cockrell School of Engineering (CSOE) Fellowship	August 2021
Samsung Q2 Yield Enhancement Individual Spotlight (SPOT) Award	June 2021

PATENTS & PATENT APPLICATIONS

1. Akinwande, D., **Kutagulla, S.** "Low Crossover, High Durability Graphene Reinforced Proton Exchange Membrane." PCT/US2025/013317, filed January 28, 2025; priority to U.S. Provisional 63/626,247, filed January 29, 2024. Assigned to Board of Regents, The University of Texas System.

2. Akinwande, D., **Kutagulla, S.**, Ajayan, P. M., Biswas, A. "Low Crossover, High Conductivity Proton Exchange Membrane with Boron Nitride Coating." PCT/US2025/044233, filed August 29, 2025; priority to U.S. Provisional 63/689,968, filed September 3, 2024. Assigned to Board of Regents, The University of Texas System.

3. Korgel, B., Caldino Bohn, I. T., **Kutagulla, S.**, Le, N. H. "Manganese Oxide-Functionalized Silicon Nanosheets Reduce Crossover and Chemical Degradation in Proton Exchange Membrane Fuel Cells." U.S. Provisional 64/030,862, filed April 6, 2026. Assigned to Board of Regents, The University of Texas System.