Shantanu Kallakuri

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Education

Cornell University — Ithaca, New York
M.S. with thesis, Materials Science and Engineering, GPA: 3.9/4 — 2018-2021

- *Advisors*: Prof. Richard Robinson & Prof. Tobias Hanrath
- *Research*: "Multiscale hierarchical structures from a nanocluster mesophase"
- *Summary*: MS thesis, 1st class hons., publication and 1 yr co-op at Applied Materials

BITS (Birla Institute of Technology and Science) Pilani — Pilani, India
Integrated B.E. in Chemical Engg. with M.S. in Chemistry, GPA: 7.5/10 — 2010-2015

Experience

Applied Materials | Process Engineer (Now Sr. P.E.) — *Santa Clara, CA* | 2021.10-Now

- *Low-k dielectrics*: Driving process, precursor development for leading-node transistor logic & memory (<2nm) on plasma-enhanced ALD and CVD tools Olympia & Sym3
- *Photonic waveguide patterning*: Developed directional and selective plasma ion etch processes with the CTO group by 2.5D grayscale lithography for AR/VR application
- *Results:* Delivered multiple projects leading to 7-figure dollar product sales at various AMAT customers, 6 patents filed (4 granted, 2 pending) and an excellence award

Cornell University | M.S. Thesis, Robinson Lab — *Ithaca, NY* | 2018.08-2021.05

- *Self-assembly*: Created a one-pot synthesis of quantum dot magic-sized nanoclusters (MSC) that self-assemble into 99.9% pure, 6% size-disperse hierarchical thin-films
- *Results:* Published this work in Nature Materials. The films exhibit huge chiroptical g-factors (>1.30), adapt to varied chemistry and scale 7 orders in magnitude (nm-cm)

MIT | Visiting Researcher, Ortony Lab — *Cambridge, MA* | 2017.03-2017.06

- *Self-assembly*: Developed precursor and head-group syntheses for amphiphilic self-assembly at Prof. Julia Ortony's lab. This work was later extended into a platform for catalysis & remediation by the team with some outstanding work in Nature nano

Harvard-MIT HST | Research Assistant, Shafiee Lab — *Boston, MA* | 2016.08-2017.02

- *Pathogen detection*: Synthesized Platinum nanomotors to bind DNA via Thiol cross-linking, Polymerase chain-reaction (PCR) & Loop isothermal amplfication (LAMP)
- *Results:* Published this work in ACS Nano & Nature Comm. Achieved 99% accurate HIV & Zika diagnosis by cellphone quantification of pathogen-bound motor velocity

IICT, CSIR | B.E. Project, Lingamallu Lab — *Hyderabad, India* | 2015.01-2015.07

- *Dye-sensitized solar cells*: Designed & synthesized a light-harvesting photo-sensitizer (η=10.3%) containing a Porphyrin macrocycle & characterized it by EIS impedance

Publications & Conferences

1. H. X. Han, **S. Kallakuri**, Y. Yao, C. B. Williamson, D. R. Nevers, B. H. Savitzky, R. S. Skye, M. Xu, O. Voznyy, J. Dshemuchadse, L. F. Kourkoutis, S. J. Weinstein, T. Hanrath and R. D. Robinson. Multiscale hierarchical structures from a nanocluster mesophase. ***Nature Materials***, **21(5): 518-525**, 2022
2. **S. Kallakuri**, Z. Zhang, R. Patil, L. Sun, M. Copic. A CNN-powered AI-driven approach to semiconductor defect classification. *AIx conference, Applied Materials*, 2022

3. M. S. Draz, K. M. Kochehbyoki, A. Vasan, D. Battalapalli, A. Sreeram, M. K. Kanakasabapathy, **S. Kallakuri**, A. Tsibris, D. R. Kuritzkes, H. Shafiee. DNA-engineered micromotors powered by metal nanoparticles for motion-based cellphone diagnostics. ***Nature Communications*, 9(1): 4282**, 2018

4. M. S. Draz, N. K. Lakshminaraasimulu, S. Krishnakumar, D. Battalapalli, A. Vasan, M. K. Kanakasabapathy, A. Sreeram, **S. Kallakuri**, P. Thirumalaraju, Y. Li, S. Hua, X. G. Yu, D. R. Kuritzkes, H. Shafiee. Motion-based immunological detection of Zika virus using Pt-nanomotors and a cellphone. ***ACS Nano*, 12(6): 5709-5718**, 2018

5. J. Avusula, **S. Kallakuri**, J. Subbalakshmi. Synthesis and characterization of templated Polyanilines: A new class of polymeric materials. *Functionalized engineering materials and their applications*, ***CRC Press** (Taylor & Francis), 1(1): 117-124*, 2016

Patents Granted

- US11956978B2: Technique & device structure with directional & selective deposition
- US20240040808A1: Technique & device structure with directional & selective deposition
- US11749564B2: Techniques for void-free material depositions
- US11404314B2: Metal line patterning
- US20220100078A1 (Filed, pending): Devices and methods for variable etch depths
- US20220119955A1 (Filed, pending): Variable deposition profiles

Skills

Thin-film growth: PECVD, PEALD, RIE, ALE, selective and directional deposition
Characterization: UV-Vis spectra, XRD, FTIR, XPS, NMR, SAXS, OES, chromatography
Patterning: 2.5D grayscale lithography, directed & amphiphilic self-assembly, ellipsometry
Optics: Grayscale litho, chiral materials, polarized and optical microscopy, laser diffraction
Synthesis: Quantum-dots, core-shell nanoparticles, conductive polymers, Porphyrin ligands
Process: Design of experiments (DOE), statistical control (SPC), in-process control (IPC)
Failure analysis: Root-cause analysis (RCA), failure analysis (FMEA, SWOT, FTA), HOQ
Statistics/Visualization: SAS (JMP), Tableau, Seaborn, Pandas, Matplotlib, Numpy, Scipy
AI/ML: Tensorflow, Pytorch, scikit, neural networks, regression, classification, clustering
Programming: Python (Fluent), Java (Fluent), C++, Javascript, SQL, HTML/CSS
Simulation/Modelling: Lammps, Comsol, Fluent CFD, Blender, AutoCad, Solidworks

Certifications

(Stanford) Harnessing the Power of AI/ML to Address New Engineering Challenges
Comprehensive 15-week course on A.I. with a final project 2024.01 - 2024.06

Awards & Honors

- **Applied Materials internship award**, Applied Materials 2020
- **Undergraduate engineering & management award**, T.I.M.E. institute 2014-2015
- **BITS Pilani merit-cum-need** (MCN) scholarship, BITS Pilani 2013-2015
- **2x Gold, 3x Bronze medals**, National sports fests BOSM, SPREE, ARENA 2015
- **Runner-up, National selection in Carrom**, All-India Carrom Federation 2014

Teaching & Mentorship

- **Teaching Assistant**, MSE5860 (Atomic Structure), Prof. Richard Robinson 2021
- **Teaching Assistant**, ENGRG1060 (Intro to Engineering), Prof. Rob Van Dover 2019
- **Mentor**, Expanding your horizons (EYH), Grade 7-10 mentor to 4 classes 2019
- **Teaching Assistant**, MSE4330 (Energy Materials), Prof. Richard Robinson 2018
- **Mentor**, Chegg Tutors, Mentor to 32 undergrads over the course of 2 years 2017

Leadership & Outreach

- **Team lead**, Asha, Raised over 18000$ in funds for rural education in India 2019
- **Artist liaison**, Spicmacay, Organized 8 concerts to popularize Carnatic music 2019
- **Outreach lead**, Yuva, Conducted 6 primary school summer-camps in India 2016
- **Organizer**, Nirmaan, Regularly held Fluoride awareness camps in rural Andhra 2015
- **Lead**, Make a difference, Held 3 donation, 2 vaccine drives for public health 2014