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Shantanu Kallakuri

Education

Cornell University Ithaca, New York
M.S. with thesis in 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 & a 1 yr co-op at Applied Materials

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

Experience

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

- *Low-k dielectrics*: Driving process, precursor development for leading-node transistor logic & memory (<2nm) on plasma-enhanced CVD and ALD tools Sym3 & Olympia
- *Photonic waveguide patterning*: Developed a directional and selective plasma ion etch process with the CTO group using 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 - 2017.07

- *Self-assembly*: Developed precursor and head-group syntheses for self-assembling amphiphiles at Prof. Julia Ortony's lab. This work was later extended into a platform for catalysis & metal remediation by the team with 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. Thesis, Lingamallu Lab *Hyderabad, India* | 2015.01 - 2015.07

- *Dye-sensitized Solar Cells*: Designed & synthesized a light-harvesting photosensitizer containing an expanded Porphyrin & characterized it by EIS impedance spectroscopy
- *Results:* Iterated synthetic pathways & achieved a high-yield solution based on Dithienopyrrole bridges (80%). This structure allowed for highly efficient DSC (η=10.3%)

Publications and Conferences

1. H. Han, **S. Kallakuri**, Y. Yao, C. Williamson, D. Nevers, B. Savitzky, R. Skye, M. Xu, O. Voznyy, J. Dshemuchadse, L. Kourkoutis, S. Weinstein, T. Hanrath and R. 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. Draz, K. Kochehbyoki, A. Vasan, D. Battalapalli, A. Sreeram, M. Kanakasabapathy, **S. Kallakuri**, A. Tsibris, D. Kuritzkes, H. Shafiee. DNA-engineered micromotors powered by metal nanoparticles for motion-based cellphone diagnostics. ***Nature Communications*, 9(1): 4282**, 2018

4. M. Draz, N. Lakshminaraasimulu, S. Krishnakumar, D. Battalapalli, A. Vasan, M. Kanakasabapathy, A. Sreeram, **S. Kallakuri**, P. Thirumalaraju, Y. Li, S. Hua, X. Yu, D. 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

- **US20240040808A1** and **US11956978B2:** Techniques & device structure based on directional seeding & selective deposition. M. Zeeshan, K. Chan, **S. Kallakuri**, S. Varghese
- **US11749564B2:** Techniques for void-free material depositions. M. Zeeshan, K. Chan, **S. Kallakuri**, S. Varghese, J. Hautala
- **US11404314B2:** Metal line patterning. S. Varghese, M. Zeeshan, **S. Kallakuri**, K. Chan
- **US20220100078A1:** Devices and methods for variable etch depths. M. Zeeshan, R. Bandy, P. Kurunczi, **S. Kallakuri**, T. Soldi, J. Olson
- **US20220119955A1:** Variable deposition profiles. M. Zeeshan, **S. Kallakuri**, J. Olson

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

Skills

Semiconductors & clean-room: Thin-film growth (PECVD, PEALD, RIE, DRIE, ALE), selective & directional deposition and etch, 2.5D grayscale lithography, ellipsometry

Chemistry & functionalization: Quantum-dots, core-shell nanoparticles, conductive polymers, donor-acceptors, Porphyrins, amphiphiles, self-assembly, chiral and optical films

Characterization & separation: UV-Vis, XRD, NMR, FTIR, SAXS, OES, XPS, Thin-film ellipsometry, chromatography, polarized & optical microscopy, optical diffraction

Experimentation & statistics: Design of experiments (DOE), statistical process control (SPC), in-process control (IPC), root-cause & failure analysis (FMEA, SWOT), HOQ, TRIZ

Modelling & Simulation: Tableau, Seaborn, SAS (JMP), Pandas, Matplotlib, Numpy, Scipy, Scikit-learn, Lammps, Gamess, Blender, Cinema4D, Solidworks, Autocad, Comsol

A.I. & M.L.: Neural networks, support vectors, regression, classification, clustering, trees

Coding: Python, Java, C++, Javascript, SQL, HTML/CSS

Awards and 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 and Mentorship

- **Teaching Assistant**, MSE5860 (Atomic Structure), Prof. Richard Robinson 2021
- **Teaching Assistant**, ENGRG1160 (Intro to Engineering), Prof. Van Dover 2020
- **Mentor, Expanding your horizons (EYH),** Grade 7-10 mentor to 4 classes 2020
- **Teaching Assistant**, MSE4330 (Energy Materials), Prof. Richard Robinson 2018
- **Mentor, Chegg Tutors,** Mentor to 32 UG students over the course of 2 years 2017

Leadership and Outreach

- **Project lead, Asha**, Raised 18000$ in fundraisers 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**, Held regular Fluoride awareness camps in rural Telangana 2015
- **Lead, Make a difference**, Held 3 donation, 2 vaccine drives for public welfare 2014