Kalyani Patrikar

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EDUCATION

Ph.D	Indian Institute of Technology Bombay **Electrical Engineering**	Jan. 2015 - Jun. 2021
M.Tech	Indian Institute of Technology Bombay **Materials Science**	Jul. 2011 - Jun. 2013
B.Tech	Visvesvaraya National Institute of Technology **Metallurgical and Materials Engineering**	Jul. 2007 - May. 2011

WORK EXPERIENCE

Early Career Fellow, *Indian Institute of Technology Gandhinagar* PRESENT

- Developed **computational model** predicting contact resistance of s functionalized organic devices
- Demonstrated microscopic **mechanism** governing charge transfer at organic-inorganic interfaces by atomistic simulations, verified with device measurements
- Developed **multiscale model** to predict OPV performance combining molecular and interface properties

Senior Research Assistant, *Center for Excellence in Nanoelectronics* Jul. 2013 - Dec. 2014

- Optimized dielectric interface to improve thermal stability and mobility of organic transitors
- Ideated and fabricated metal oxide nanoparticles embedded in organic transistors for H_2S **sensors**

Intern, *Indian Nanoelectronics User Program* May - Jun. 2010

- Studied **self assembly** of Si **quantum dot** on SiO_2 and HfO_2 by ab-initio calculations
- **fabricated** and characterized 100 nm Si quantum dot arrays from stressed Si thinfilm on high-k dielectric HfO_2 film

PhD THESIS

Bulk and Interfacial Charge Transport in Organic Field Effect Transistors

Advisors: Prof. Dinesh Kabra (*Physics*), *Prof. V. Ramgopal Rao* (*Electrical Engineering*)

- Developed Monte Carlo algorithm based **multiscale model** to analyse measured temperature dependent characteristics of organic transistors
- Demonstrated novel charge doping **mechanism** of self assembled monolayers at transistor contacts by developing physics based **device model** based on ab-initio **computations** and device characterization
- Analyzed polaron transport in polymers transistors by **density functional theory** calculations, to identify molecular structure substitutions increasing mobility by an order of magnitude
- Established new **paradigm** for improving device performance by an order by pendant group substitution

M.TECH THESIS

Mechanical Properties of Hot Wire CVD a-SiC:H Thinfilms

Advisors: Prof. Rajiv Dusane (*Materials Science*), *Prof. Prita Pant* (*Materials Science*)

- **Synthesised** Silicon-Carbon alloy thinfilms with different combination of phases by hot wire **CVD**
- Measured thinfilm mechanical properties by nanoindentation, **modelled** data to obtain Young's modulus independent of nanoindenter displacement and substrate, correlated with film **microstructure**
- **Fabricated** and characterized a-Si:C microbridges for MEMS

ACADEMIC ACTIVITIES

- **Teaching**: Flexible Electronics (SC 343), Organic Semiconductors & Devices (Guest lecture EE 221) at IIT Gandhinagar
- **Teaching Assistant:** Physics of Transistors, VLSI Technology, Thermodynamics, Machine Learning
- **Reviewer**: *IEEE Journal on Flexible Electronics, IEEE Transactions on Electron Devices*
- Optimized a graph **neural network** to predict properties from molecular structure

TECHNICAL SKILLS

Thinfilm Technologies	PVD (System In-charge), CVD, Solution Processing, Lithograhy
Electrical Characterization	I-V, C-V, Cryogenic I-V, TLM, Four probe, EQE
Material Characterization	Nanoindentation, AFM, XPS, SEM, XRD, Raman
Lab Training	Class 100 and Class 1000 Clean Room, Glove Box, Chemistry Lab
Software	CP2K, Gaussian09, Quantum Espresso, Jmol, TCAD
Computation	Python, Maltab, GNU Octave

EXTRACURRICULAR ACHIEVEMENTS

- Institute Executive Member, part of IIT Bombay Post Graduate Academic Council (2012-2013)
- Warden's Nominee at Institute female residential hostel IIT Bombay (2016-2017)
- Silver in **Tennis** Indian Inter-Institute Tournament (2016)
- High Altitude **Treks** completed in Uttarakhand, India

KEY PUBLICATIONS

Journal

1. **Kalyani Patrikar**, Valipe Ramgopal Rao, Dinesh Kabra, Anirban Mondal, "Understanding the Microscopic Origin of the Contact Resistance at the Polymer–Electrode Interface", *ACS Applied Materials & Interfaces, 2023* https://doi.org/10.1021/acsami.3c10260
2. **Kalyani Patrikar**, Anirban Mondal, "Polarity and Orbital Driven Modulation of Contact Resistance of Organic-SAM Functionalized Electrode" *Journal of Chemical Physics, 159, 121102, 2023* https://doi.org/10.1063/5.0170627
3. Gayatri Joshi*, R. Kashyap*, **Kalyani Patrikar*** Anirban Mondal, and Saumyakanti Khatua, "Ligand-Mediated Electron Transport Channels Enhance Photocatalytic Activity of Plasmonic Nanoparticles" Nanoscale, 2023,15, 16552 (* Equal Contribution Authors) https://doi.org/10.1039/D3NR02829A
4. **Kalyani Patrikar**, Urvashi Bothra, Valipe Ramgopal Rao, and Dinesh Kabra, "Charge Carrier Doping As Mechanism of Self-Assembled Monolayers Functionalized Electrodes in Organic Field Effect Transistors", *Adv. Mater. Interfaces 2021, 2101377* https://doi.org/10.1002/admi.202101377
5. **Kalyani Patrikar**, Nakul Jain, Dwaipayan Chakraborty, Priya Johari, Valipe Ramgopal Rao, and Dinesh Kabra "Influence of Pendant Group on Mobility of Organic Thin Film Transistor in Correlation with Reorganization Energy of Molecules." *Advanced Functional Materials, 29.8 (2019): 1805878* https://doi.org/10.1002/adfm.201805878

Conference

1. "Role of Pendant Group in Organic Semiconductor Charge Transport Rate and Energetics", Oral presentation at *MRS Fall Symposium 2020*
2. "Interfacial Doping in Organic Semiconductors with Self Assembled Monolayer at Electodes", Oral presentation at *MRS Fall Symposium 2020*
3. "Mechanical Properties of a-SiC:H Thinfilms" Oral presentation at *13th European Vacuum Conference and 7th European Topical Conference on Hard Coatings 2014.* (Selected for **Student Award**)