

# Kalyani Patrikar

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## EDUCATION

PhD	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

## Summary

Having extensive experience in device fabrication, device characterization including cryogenic characterization and nano-characterization, device modelling, density functional theory computations with molecules and thinfilms, and numerical and analytical simulations, I am interested in applying these to novel devices and physics.

## Ph.D. THESIS

### Charge Transport in Bulk and Interfaces of Organic Field Effect Transistors

*Advisors: Prof. Dinesh Kabra (Physics, IIT Bombay), Prof. V. Ramgopal Rao (Electrical Engg., IIT Bombay)*

- Probed, modelled, and experimentally studied features of **charge transport** in various organic devices
- Demonstrated **novel** charge doping **mechanism** of self assembled monolayers at interfaces
- Developed **device models** to predict interface properties, and device characteristics, for OFETs functionalized with self assembled monolayers
- Demonstrated **reorganization energy** to be a key parameter influencing charge carrier mobility in Donor-Acceptor polymers by correlating DFT and experimental studies
- Performed Monte-Carlo Numerical **simulations** study to complement variable temperature device **measurements** to obtain interplay of molecular and thinfilm parameters in **charge transport** in polymers

## MASTER'S THESIS

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

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

- Synthesised and characterized Silicon-Carbon alloy thinfilms consisting of different combination of phases by **HWCVD** technique
- Studied thinfilm mechanical properties by **nanoindentation**, **modeled data** to obtain Young's modulus independent of nanoindenter displacement
- Fabricated and Characterized a-Si:C **microbridges**

## WORK EXPERIENCE

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- **Teaching Assistant, IIT Bombay** (Jan. 2015-Jun. 2021)
  - Involved in planning course content, conducting classes, and evaluating students in courses including Physics of Transistors, VLSI Technologies, Communication Skills
- **Senior Research Assistant, Center for Excellence in Nanoelectronics** (Jul. 2013 - Dec. 2014)
  - Analysed role of dielectric interface in OFET thermal **stability**
  - Improved mobility of solution processed OFETs by process and device stack **optimization**
- **Intern, Indian Nanoelectronic User Program** (May - Jun. 2010)
  - **Simulated** Si quantum dot-HfO<sub>2</sub> system by DFT to obtain lowest energy structure
  - **Fabricated** regular shaped 100 nm Si nanocrystals on HfO<sub>2</sub> thinfilms from CVD thinfilm for application in high-k dielectric flash memory devices

## TECHNICAL SKILLS

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<b>Thinfilm Technologies:</b>	PVD, CVD, Spin-coating, Lithography
<b>Characterization:</b>	Electrical characterization, XRD, Nanoindentation, AFM, XPS, SEM
<b>Lab Training:</b>	Class 100 and Class 1000 Clean Room, Glove Box, Chemistry Lab
<b>Computation:</b>	DFT tools (Gaussian09, Quantum Espresso), Python & Numpy, Matlab

## EXTRACURRICULAR ACHIEVEMENTS

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- **Institute Executive Member**, part of IIT Bombay PG Academic Council (2012-2013)
- Silver in **Tennis** Inter-Institute Tournament 2016
- Winning team at Institute "Research Only For Laughs (ROFL)" for explaining paper with a short sketch
- **Blog** at "medium.com/@k.r.patrikar"
- **High Altitude Treks** completed in Uttarakhand, India

## PUBLICATIONS

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### Journal

1. **Kalyani Patrikar**, Valipe Ramgopal Rao, and Dinesh Kabra, "Role of Charge Transfer Integral in Evolution of Charge Transport Properties of Polymer Semiconductors", Submitted to *Physical Review Applied*.
2. **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>
3. **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>
4. Nakul Jain, Rishabh Saxena, Sumukh Vaidhya, **Kalyani Patrikar**, V. Ramgopal Rao, Christopher R. McNeill and Dinesh Kabra, Quasi Fermi Level Splitting in Organic Bulk Hetero-Junction Solar Cell, submitted to Physical Review Letters

### 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 Monolayers at Electrodes", **Oral** presentation at **MRS Fall Symposium 2020**.
3. "Mechanical Properties of a-SiC:H Thinfilms" **Oral** presentation at 13<sup>th</sup> European Vacuum Conference and 7<sup>th</sup> European Topical Conference on Hard Coatings 2014
4. "Growth of Si Quantum dot/Nanocrystal on Hafnium Oxide films" **Oral** presentation at International Conference on Nanotechnology- Materials and Composites Frontier Applications 2011