CURRICULUM VITAE

Personal Details

Name:	Sankara Rao Gollu
Place of Birth:	Visakhapatnam, Andhra Pradesh, India
Marital Status:	Married (Haritha), twin babies
Address:	Room 1.05, School of Chemistry, University of Manchester, Oxford Road, Manchester M13 9PL U.K.
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Education

Ph.D. in Materials Engineering	July 2011–March 2016
Indian Institute of Technology-Bombay, Mumbai, India.	Thesis Advisor: *Prof. Dipti Gupta*
Thesis Title: Fabrication and characterization of organic semiconductor devices	
Summary – My research was focused on improvement of light absorption and charge transport by incorporation various nanostructures organic photovoltaic devices. Output - 12 co-authored publications in high impact international peer-reviewed journals - 5 first author (including DFT calculations based articles), 2 second author publications and 2 publications from collaborative projects (See Google Scholar Profile). I have also presented my work at 7 international conferences (3 talks and 4 poster).	
M. Tech. in Materials Engineering	August 2009 - June 2011
University of Hyderabad, Hyderabad, India.	
M.Sc. in Physics	July 2006 – May 2008
Andhra University, Visakhapatnam, India.	
B.Sc. in Physics, Mathematics, and Chemistry	July 2003 – May 2006
Andhra University, Visakhapatnam, India.	

Profile Summary

- Strong interest in working at the interface of emerging technology areas, assessing both technical and commercial aspects
- Experience in working within multidisciplinary projects alongside synthetic chemist, material scientists, elactrical engineers and device physicists
- Proven scientific technical expertise in the field of materials engineering specifically in organic electronics
- Extensive experience in organic semiconductor material design, thin-film fabrication, characterisation and device engineering of organic field-effect-transistor, organic photovoltaics, phtodetectors and flexible electronic sensors.

Research Interests

- Printed electronics
- Preparation of both metal oxide and organic semiconductors based electronic devices using printing/solution processes. Preparation of nanoparticles and inks.
- Characterization of materials and thin films
- Electrical and structural characterization of different materials and thin films to understand structure-property relations. Improving film quality in order to improve device performances.
- Sensors

- Organic field-effect transistor (OFET) based sensors to detect volatile organic compounds and different gases. Electronic nose using OFET based sensor arrays.

Research Experience

Post-Doctoral Research Associate (January 2019-Present)
National Graphene Institute (NGI) and School of Chemistry, University of Manchester, U.K.
– Supervisors: Prof. Michael L Turner and Prof. Krishna. C. Persaud
• Part of the iPESS (integration of Printed Electronics with Silicon for Smart Sensors) and Innovate UK projects (PlasticArmpit) and working with multiple industries (Arm, Unilever, Pragmatic).
• Developed organic field-effect transistors to detect extremely low concentrations. (parts per million to parts per billion) of volatile organic compounds and gases.
• Delivering project goals and managing the project effectively.

Summary - Integration of Printed Electronics for Smart Sensor Systems in collaboration with the Cavendish Laboratory, University of Cambridge as part of the EPSRC Centre for Innovative Manufacturing in Large Area Electronics. I am primarily involved in developing high performance polymer gate dielectrics for stable low voltage organic field-effect transistor for a chemical sensor array platform.
Output – 2 manuscripts in preparation (1 first author) and a poster presentation at the Innovations in Large-Area Electronics Conference (INNOLAE), Cambridge, UK.

Post-Doctoral Research Fellow (June 2017- March 2018)

School of Electrical and Electronic Engineering (EEE), Nanyang Technological University (NTU), Singapore.
– Supervisor: Prof.Ang Diing Shenp

- Fabrication and characterization of novel oxide-based nanoelectronic devices (memristors).
- Nano scale resistive switching memory (memristors), Resistive switching for ReRAM, synaptic and neuromorphic applications.
- Understanding charge-trapping evolution in low dimension and oxide memory devices (HfO_2, Al_2O_3, TiO_2 etc). (Output of this work leads to publication in ACS Nano)
- Reliability physics and characterization of nanoscale devices (gate oxide breakdown, non-volatile memory device fabrication in clean room environment)
- Inorganic perovskite, NiO, Cu-ZnO based memory devices (ReRAM)
- Optoelectronics (plasmonic Photodetectors) using electron beam lithography
- Output –3 papers published, 2 poster presentations 3 conference talks, 1 patent (preparation)

Postdoctoral fellow (May 2016-May 2017)

Department of Physics, University of Basel, Switzerland.
- Thermoelectric and Photovoltaic properties of nanowires (InAs, InP, Perovskite) for energy conversion related applications.
- Built the setup of complex experimental technique in which Raman spectroscopy is combined with electrical measurements for thermoelectric devices.

Technical skills and Expertise

- **Nanomaterials synthesis technique:** Advanced knowledge and experience on the design and synthesis of nanostructures and various characterization techniques:
    - Sol- Gel, Hydrothermal, Solvo thermal, Hot injection etc.

- UV-VIS-NIR. FT-IR, Raman, fluorescence Spectrometry, Cyclic voltammetry, Time Correlated Single Photon Counting (TCSPC), X-ray photoelectron spectroscopy (XPS) and Transmission electron microscopy (TEM).

- **Morphological Characterization:** Significant experience in morphological characterization of organic semiconducting thin films
  - Atomic Force Microscopy, Nanomechanical mapping and Kelvin Probe Force microscopy
  - Optical Microscopy, Scanning Electron Microscopy (SEM), contact angle
- **Device Fabrication and Characterization:** Significant experience in formulation of inks for solution processed thin-films. Device fabrication of organic solar cells, organic field effect transistors, photodetectors and memory devices and vacuum deposition of metal electrodes via sputtering and thermal evaporation. Electrical measurements by Capacitance-Voltage, Current-Voltage measurements using-Agilent's E4980, Keithley 4200 SCS.
- **Semiconductor device simulations**: Optical simulations by Lumerical Finite difference time-domain (FDTD) and Electrical simulations by Technology Computer Aided Design (TCAD) Santarus.
- **DFT calculations**: Density functional theory (DFT-First principles study) of semiconducting nanostructure materials for sensing and storage applications using Vienna Ab-initio simulation Package (VASP) code.

Thesis Supervising and mentoring activities

Doctoral Program

Name of the Student	Thesis Title	Awarding University /Institute	Date of Defense	Primary/Co-Supervisor
Jincheng	EGOFETS for bio sensing	University of Manchester	15.01.2019-ongoing	Co-Supervisor
Usman Raja	EGOFETS for cancer cell detection	University of Manchester	15.01.2019-ongoing	Co-Supervisor
M Hassan	Optoelectronic materials for synaptic and bio-medical devices	NTU Singapore	15.02.2018	Co-Supervisor
R. Akhil	Plasmonics for optical detection	NTU Singapore	05.06.2016-ongoing	Co-Supervisor
Pranav K	Nanoscale Electro-Optical Switch/Sensor applications	NTU Singapore	15.09.2016-ongoing	Co-Supervisor

Master's Program

Name of the Student	Thesis Title	Awarding University /Institute	Date of Defence	Primary/Co-Supervisor
Adiba Muhammed	CNPs for OFETS	University of Manchester	20.06.2019	Co-Supervisor
Pray Jnru	OFTS: dielectric optimization	University of Manchester	15.06.2019	Co-Supervisor
Liu YU	CsPbBr3 based Perovskite solar cells	NTU Singapore	05-01-2018	Supervisor
Yang Yin	Optical simulations of CsPbBr3 based Perovskite solar cells	NTU Singapore	12-01-2018	Supervisor
Zhou Yu	Thin film TFTs	NTU Singapore	06.07.2017	Supervisor
Liu Yang	HfO2 based RRAM	NTU Singapore	01.06.2017	Co- Supervisor
Mayank sinha	Organic solar cells (OSCs) lumericcal simulations	IIT Bombay	20-05-2014	Co- Supervisor

Aftabuddin Seik	Pentacene based OTFTS	IIT Bombay	30-05-2013	Co- Supervisor
Sankesha B	Al doped ZnO for solar cells application	IIT Bombay	21-05-2013	Co- Supervisor
M.Venkateswarlu	ZnO based TFTs	IIT Bombay	23-05-2013	Co- Supervisor

Reviewer activity

The fellow is peer-reviewing articles in journals such as Organic Electronics, IOP Nanotechnology.

International Journal and conference Publications

1. P. Joshna, **S. R. Gollu**, P Michael Preetam Raj, B.V.V.S.N P. Rao, Parikshit Sahatiya, and Souvik Kundu, "Plasmonic Ag Nanoparticles Arbitrated Enhanced Photodetection in p-NiO/n-rGO Heterojunction for Future Self-powered UV Photodetectors" **Nanotechnology 30 (2019) 365201**

2. Sivakumar Ganesan, **Sankara Rao Gollu**, Javed Alam khan, Ashok Kushwaha and Dipti Gupta," Inkjet printing of Zinc oxide and P3HT: ICBA in ambient conditions for inverted bulk heterojunction solar cells" **Optical Materials 94, (2019), 430-435.**

3. Aiman Rahmanudin, **Sankara Rao Gollu**, Daniel Tate, Raymundo Marcial-Hernandez, Nicolas Bull, Suresh Garlapati, Adibah Zamhuri, Raja Usman Khan, Sheida Faraji, Krishna Persaud, and Michael Turner Robust High-Capacitance Polymer Gate Dielectrics for Stable Low-Voltage Organic Field Effect Transistor Sensors (**Advanced Electronic Materials, under review).**

4. Dan Berco, Yu Zhou, **Sankara Rao Gollu**, Pranav Sairam Kalaga, Abhisek Kole, Mohamed Hassan and Diing Shenp Ang, "Nanoscale Conductive Filament with Alternating Rectification as an Artificial Synapse Building Block" **ACS Nano, 2018, 12 (6), pp 5946–5955.**

5. Pavan Kumar Reddy Boppidi, P Michael Preetam Raj, Swapna Challagulla, **Sankara R Gollu**, Sounak Roy, Souri Banerjee, Souvik Kundu , "Unveiling the dual role of chemically synthesized copper doped zinc oxide for resistive switching applications", **Journal of Applied Physics, 124, 214901 (2018).**

6. S. R. Naqvi, **G. S. Rao,** Wei. Luo, R. Ahuja and T. Hussain, "Hexagonal Boron Nitride (h-BN) sheets decorated with OLi, ONa and Li2F molecules for enhanced energy storage", **ChemPhysChem 18 (2017) 1-7.**

7. Sankara Rao Gollu, Ramakant Sharma, Srinivas G, Souvik Kundu and Dipti Gupta, "Incorporation of silver and gold nanostructures for performance improvement in P3HT: PCBM inverted solar cell with rGO/ZnO nanocomposite as an electron transport layer" **Organic electronics 29 (2016) 79-87**.

8. Srinivas Gandla, **Sankara Rao Gollu,** Harshad Gupta, Anil Reddy Pininti, Amit Tewari, Dipti Gupta Highly elastic polymer substrates with tunable mechanical properties for stretchable electronic applications, **RSC Advances 107793-107799 (2016) 6**

9. Sankara Rao Gollu, Ramakant Sharma, Srinivas G, Souvik Kundu and Dipti Gupta, "Incorporation of SiO2 dielectric nanoparticles for performance enhancement in P3HT: PCBM inverted organic solar cells" **Organic Electronics 24 (2015) 43-50.**

10. Srinivas Gandla, **Sankara Rao Gollu**, Ramakant Sharma, Venkateswarlu Sarangi and Dipti Gupta, "Dual role of boron in improving electrical performance and bias stability of low temperature solution processed ZnO thin film transistors" **Appl. Phys. Lett. 107, 152102 (2015).**

11. **Sankara Rao Gollu**, Ramakant Sharma, Srinivas G, Souvik Kundu and Dipti Gupta, "Effects of Incorporation of Copper Sulfide nanocrystals on the performance of P3HT: PCBM based Inverted Solar Cells" **Organic Electronics 15 (2014) 2518–2525.**

12. Souvik Kundu, **Sankara Rao Gollu**, Ramakant Sharma, Srinivas G, Adersh Ashok, A. R. Kulkarni and Dipti Gupta, "Device stability of inverted and conventional bulk heterojunction solar cells with MoO3 and ZnO nanoparticles as charge transport layers", **Organic Electronics 14 (2013) 3083–3088.**

13. Souvik Kundu, **Sankara Rao Gollu**, Ramakant Sharma, Nripendra. N Halder, Pranab Biswas, P. Banerji, and Dipti Gupta, "GaAs metal-oxide-semiconductor based nonvolatile memory devices embedded with ZnO quantum dots", **Journal of Applied Physics 114 (8), 084509 (2013)**.

14. Panigrahi Puspamitra, Dhinakaran Ashok Kumar, Naqvi Syeda Rabab, **Gollu Sankar Rao**, Ahuja Rajeev, Hussain Tanveer, "Light Metal Decorated Graphdiyne (GDY) Nanosheets for Reversible Hydrogen Storage" **IOP Nanotechnology 29(35) (2018) 355401**

15. M. S. Islam, T. Hussain, **G. S. Rao**, P. Panigrahi and Rajeev Ahuja, "Augmenting the sensing aptitude of hydrogenated graphene by crafting with defects and dopants" **Sensors and Actuators B: Chemical, 228 (2016) 317-321**

16. **G. S. Rao**, T. Hussain, M. Sagynbaeva, M. S. Islam, Dipti Gupta, P. Panigrahi and Rajeev Ahuja, "Adsorption Properties of Graphene like ZnO Monolayer towards CO2 molecules: Enhanced CO2 Capture" **Nanotechnology 27 (2015) 1.**

17. **Gollu Sankara Rao**, Tanveer Hussain, Muhammed Shafiqul Islam, Puspamitra Panigrahi, Dipti Gupta, and Rajeev Ahuja, "Hydrogen Storage Properties of Light Metal Adatoms (Li, Na) Decorated Fluorographene Monolayer", **Nanotechnology 26 (2015) 275401.**

18. **Sankara Rao Gollu**, Ken.K.S, Alana K.S, Xiang Zhang, MY.Hassan, P. S. Kalaga, Yang kong Tye and D. S. Ang, "High-performance plasmonic asssited perovskite flexible photodetectors based on solution- processed all-inorganic CsPbBr3 thin films". (**JAP, under review).**

19. Sivakumar Ganesan, **Sankara Rao Gollu**, Ashok Kushwaha and Dipti Gupta, "Performance of PCPDTBT: PCBM based organic solar cells with inkjet printed hole transport layer" **(Japanese Journal of Applied Physics, under review).**

20. Jincheng Tong, Amadou Doumbia, **Sankara Rao Gollu**, Michael L. Turner and Cinzia Casiraghi **"**In-situ monitoring of organic crystal growth from droplet by Electrolyte-gated Field Effect Transistors" **(Advanced Materials, under review).**

Conference Presentations (Oral/ Poster)

1. Y.Zhou, D. S. Ang, P.S. Kalaga and **S.R. Gollu**, "Oxide breakdown path for optical sensing at the nanoscale level" **IEEE International Reliability Physics Symposium (IRPS) 17737118 (2018).**

2. M. Y. Hassan, **S. R. Gollu**, and D. S. Ang, Tunable Localized Surface Plasmon Resonance Of Subwavelength Cu/Sio2/Al Plasmonic Antenna. **(IEEE, 2017 Progress in Electromagnetics Research Symposium-Fall (PIERS-FALL), 1660-1665)**

3. **Sankara Rao Gollu**, Ramakant Sharma, Srinivas G and Dipti Gupta, "Thermal annealing study on P3HT-PCBM based Bulk heterojunction organic solar cells using Impedance spectroscopy" **AIP Conference Proceedings 1620, 150 (2014).**

4. **Sankara Rao Gollu**, M.S.Murthy, Ramakant Sharma, Srinivas G, Swaroop Ganguly, Dipti Gupta, "Enhanced efficiency of inverted bulk heterojunction solar cells with embedded silica nanoparticles" 40th IEEE Photovoltaic Specialists Conference, June 8-13, 2014, at Colorado, USA. (**Photovoltaic Specialist Conference (PVSC), 2014 IEEE 40th, 1745-1749**).

5. **Sankara Rao Gollu**, Ramakant Sharma, Srinivas G, Venkateswarlu S, Aftabuddin Shaikh, Dipti Gupta, "Efficiency improvement of Inverted Bulk Heterojunction solar cells using Molybdenum Oxide as Hole Transport Buffer Layer" **(poster).**

6. **S.R.Gollu**, S.Bhoyar, R.Sharma, S.Gandla, V. Sarangi, A.Shaikh, D.Gupta, "Solution processable Aluminum doped zinc oxide (AZO) thin film for Organic Photovoltaics application" (International workshop on Nanotechnology and Advanced functional Materials (NTAFM), July 24-25, 2013 at Pune, India.

7. **Sankara Rao Gollu**, Ramakant Sharma, and Dipti Gupta, "Towards efficient and low cost organic bulk heterojunction solar cells" (Presented poster in 4th McDonnell Academy Global Energy and Environment Partnership (MAGEEP), Symposium in collaboration with Washington University in St.louis, USA. (December 9 - 12, 2012 in Mumbai, India.)

8. **Sankara Rao Gollu**, M.S.Murthy, R. Sharma, M.S.Islam, G. Srinivas, S. Ganguly, D. Gupta, "Efficiency enhancement of inverted bulk heterojunction solar cells with embedded silver nanoparticles" (ICMAT2015 & IUMRS-ICA2015 - MRS-S, 28 June - 3 July 2015, Singapore).

9. **Sankara Rao Gollu**, M.S.Murthy, R. Sharma, M.S.Islam, G. Srinivas, S. Ganguly, D. Gupta, "Efficiency enhancement of inverted bulk heterojunction organic solar cells with embedded gold nanoparticles" (42nd IEEE Photovoltaic Specialists Conference (PVSC), June 14-19, 2015 at New Orleans, LA, USA).

10. **G. S. Rao**, M. S. Islam, M. Sagynbaeva, T. Hussain, Dipti Gupta, and Rajeev Ahuja, "Sensing properties of graphene like ZnO monolayer towards CO2 and SO2 gases" (Nanotech France 2015 International Conference & Exhibition, 15 Jun - 17 Jun 2015, Paris - France).

11. M. S. Islam, **G. S. Rao**, T. Hussain and Rajeev Ahuja, Light metal functionalized fluorographene as a high capacity hydrogen storage material (Submitted to Nanotech France 2015 International Conference & Exhibition, 15-17 June 2015, Paris - France).

12. M. S. Islam, **G. S. Rao**, T. Hussain and Rajeev Ahuja, Sensing properties of pure, defected and light metal doped hydrogenated graphene monolayer towards CH4 (Advanced Materials World Congress (AMWC). 23–26 August 2015. Stockholm, Sweden).

Teaching Experience

Praktikum teaching for master's students at University of Basel, Switzerland	September 2016 - April 2017
Graduate Assistant, Department of Materials Engineering	July 2012 - May 2013
Indian Institute of Technology, Mumbai, India.	
Instructed laboratory courses on Solid state materials and Photovoltaic	
Graduate Assistant, Department of Materials Engineering	Aug 2012 – May 2014
Indian Institute of Technology, Mumbai, India.	
Instructed undergraduate courses on Microelectronics. Provided undergraduate students on microfabrication.	

Prizes and Awards

1. DAAD fellowship from Germany to pursue Ph.D, University of Münster, 2009

2. ERASMUS MUNDUS European fellowship to pursue Ph.D. exchange studies at Uppsala University, August 2014
3. Academic Council member by the Vice Chancellor of University of Hyderabad, 2009-2011.
4. secured all India 3rd rank in the entrance exam into Master of Technology, University of Hyderabad, 2009

Funding Received so far and Projects undertaken

Project Title	Funding Agency	Funding Amount(S$)	University/Institute where work done
Reliability physics and characterization of nanoscale transistors	MOE Tier 2, Singapore	60,000	EEE@NTU Singapore
High performance flexible optoelectronic devices	A*STAR and Toshiba Singapore	55,000	ERIAN@NTU Singapore

I hereby affirm that the above pieces of information are true to my best knowledge.

Date: 26th Sepetember 2019. Sankara Rao.