Detailed Bio-data

Dr. Subhash Singh
Assistant Professor, NIT Bhopal,

Postdoctoral Research Fellow
Indian Institute of Science Bangalore

Former Postdoctoral Research Fellow
University of Pisa, Italy

Former Postdoctoral Research Fellow
Yamagata University, Japan

Ph. D in Materials Science
Thesis Supervisor – Prof. Y. N. Mohapatra
Indian Institute of Technology Kanpur,
National Center for Flexible Electronics
Kanpur, India, PIN-208016
Email: subhash@manit.ac.in,
subhash.negi08@gmail.com
Contact No: +91-9005819664

EXPERTISE AND RESEARCH INTERESTS

- Condensed Matter Physics
- Organic Optoelectronic Materials and Devices
- Organic Thin Film Transistors and integrated circuits
- Printed and Flexible Electronics
- Physics of organic semiconductors: charge injection and transport properties
- 2D Materials
- Materials Science

EDUCATION

Ph. D. (Materials Science)	Indian Institute of Technology Kanpur, Kanpur, INDIA (July 2011 to January 2018, CPI 8.0 out of 10) Thesis Title: "*Trap Kinetics in TIPS-Pentacene based Organic Thin Film Transistors (OTFTs): A study using current transients*", Thesis Supervisor: Prof. Y. N. Mohapatra
M. Tech (Materials Sci.& Engineering)	Indian Institute of Technology Kharagpur, Kharagpur, INDIA (2009-2011, CPI 8.1 out of 10) Thesis Title: *"Synthesis and characterization of Tungsten Oxide nanoparticles for LPG gas sensing application in a homemade static gas chamber",* Thesis Supervisor: Prof. S. B. Majumder

M. Sc. (Physics)	H. N. B. Central University, Uttarakhand, INDIA. (73.33%)
B. Sc. (Physics, Chemistry, Mathematics)	H. N. B. Central University, Uttarakhand, INDIA. (74.33%)

POSTDOCTORAL RESEARCH EXPERIENCE

Postdoctoral Research Fellow	Department of Instrumentation and Applied Physics, Indian Institute of Science, Bangalore, **India** (August 2022 to Till date).
Postdoctoral Research Fellow	Department of Information Technology, University of Pisa, **Italy** (March 2021 to April 2022).
Postdoctoral Research Fellow	Research Centre for Organic Electronics, Yamagata University, **Japan** (April 2019 to December 2020).
Project Engineer	National Center for Flexible Electronics, Indian Institute of Technology Kanpur, **India** (January 2018 to March 2019).

LIST OF PUBLICATIONS

Journal Publications

1. Piyush Ranjan, Omkar Shinkre, Subhash Singh, Haresh Kumar, Sreelal Pillai, Sanjiv Sambandan, "Tunable Threshold Thin Film Transistor: A Sub-circuit that Emulates a Thin Film Transistor with an Adjustable Threshold Voltage", **IEEE Journal on Flexible Electronics, (Under Review, November 2025).**
2. **Subhash Singh,** "Fabrication of flexible single-wall carbon nonotubes thin film transistors and inverters", **Physica Scripta, Vol. 100, 085912 (2025).**
3. Sneha Chaudhary, **Subhash Singh,** Chithra Parameswaran, and Sanjiv Sambandan, "Thin Film Transistor Amplifiers on Cellulose Acetate", **IEEE Journal on Flexible Electronics Vol. 4, 218-224 (2025).**

4. **Subhash Singh,** "Fully solution-processed carbon nanotubes thin film transistors and PMOS inverters on glass substrate", **Flex. Print. Electron., Vol. 8, 015011 (2023).**
5. **Subhash Singh,** Hiroyuki Matsui, and Shizuo Tokito, "Printed dual-gate organic thin film transistors and PMOS inverters on flexible substrates: Role of top gate electrode", **J. Phys. D: Appl. Phys., Vol. 55, 135105 (2022).**
6. **Subhash Singh,** Hiroyuki Matsui, and Shizuo Tokito, "Flexible low-voltage organic thin-film transistors and PMOS inverters: the effect of channel width on noise margin", **J. Phys. D: Appl. Phys., Vol. 54, 315102 (2021).**
7. **Subhash Singh,** Hiroyuki Matsui, and Shizuo Tokito, "Flexible high-performance organic thin film transistors and PMOS inverters: Trap controlled grain boundaries and contact resistance effect in different channel length devices", **Synthetic Metals, Vol. 278, 116808 (2021).**
8. Basanagouda B Patil, Yasunori Takeda, **Subhash Singh**, Amandeep Singh, Thu Trang Do, Kostya (Ken) Ostrikov, Samarendra P Singh, Shizuo Tokito, Ajay K Pandey, and Prashant Sonar, "Single and dual-gate organic field-effect transistors based on diketopyrrolopyrrole-diethienothiophene polymers: performance modulation via dielectric interfaces", **Mater. Res. Express, Vol. 8, 096301 (2021).**
9. **Subhash Singh,** Yasunori Takeda, Hiroyuki Matsui, and Shizuo Tokito, "Flexible PMOS Inverter and NOR Gate Using Inkjet-Printed Dual-Gate Organic Thin Film Transistors", **IEEE Electron Device Letters., Vol. 41 (3), pp. 409-412 (2020).**
10. **Subhash Singh,** Yasunori Takeda, Hiroyuki Matsui, and Shizuo Tokito, "Flexible Inkjet-Printed Dual-Gate Organic Thin Film Transistors and PMOS Inverters: Noise Margin Control by Top Gate", **Org. Electron., Vol. 85, 105847 (2020).**
11. **Subhash Singh** and Y. N. Mohapatra, "TIPS-pentacene based MIS structure using a polymer insulator: role of interface traps studied using HMDS treatment, frequency and light intensity", **Physica Scripta, Vol. 95, 055812 (2020).**
12. Basanagouda. B. Patil, Yasunori Takeda, **Subhash Singh**, Tony Wang, Amandeep Singh, Thu Trang Do, Samarendra P. Singh, Shizuo Tokito, Ajay K. Pandey, and Prashant Sonar, "Electrode and dielectric layer interface device engineering study using furan flanked diketopyrrolopyrrole–dithienothiophenepolymer based organic transistors", **Nature Scientific Reports, Vol. 10, 19989 (2020).**

13. Sk. Md. Obaidulla, **Subhash Singh**, Y. N. Mohapatra, and P. K. Giri, "Ambient condition bias stress stability of vanadium (IV) oxide phthalocyanine based p-channel organic field-effect transistors", **J. Phys. D: Appl. Phys., Vol. 51, 015110 (2018).**
14. **Subhash Singh** and Y. N. Mohapatra, "Origin of switching current transients in TIPS-pentacene based organic thin-film transistor with polymer dielectric", **Appl. Phys. Lett., Vol. 110, 233301 (2017).**
15. **Subhash Singh** and Y. N. Mohapatra, "Bias stress effect in solution-processed organic thin-film transistors: Evidence of field-induced emission from interfacial ions", **Org. Electron., Vol. 51, pp. 128-136 (2017).**
16. **Subhash Singh** and Y. N. Mohapatra, "Trap kinetics in solution-processed organic thin-film transistors", **IEEE Electron Device Letters., Vol. 37, 38 (2016).**
17. **Subhash Singh** and Y. N. Mohapatra, "Persistent photocurrent (PPC) in solution-processed organic thin film transistors: mechanisms of gate voltage control", **J. Appl. Phys., Vol. 120, 045501 (2016).**

Conference Proceedings

1. **Subhash Singh** and Y. N. Mohapatra, "Dielectric optimization for inkjet-printed TIPS-pentacene organic thin-film transistors", **Proc. IEEE 2nd Int. Conf. Emerg. Electron., Dec. 2014**, held at IISc Banglore, India. (pp. 1–4. **DOI:** 10.1109/ICEmElec.2014.7151176).
2. **Subhash Singh** and S. B. Majumder, "Synthesis, characterization and liquefied petroleum gas (LPG) sensing properties of WO_3 nano-particles", **AIP Conf. Proc. Vol. 1953, 090042 (2018).**
3. **Subhash Singh** and Y. N. Mohapatra, "Degradation and Bias-Stress Effect in TIPS-Pentacene Based Organic Thin Film Transistors with Polymer Dielectric", **International Workshop on the Physics of Semiconductor and Devices, Vol. 215, 1077-1081 (2019).**

Conference/Workshop Attended

1. **Subhash Singh** and Y. N. Mohapatra, "*Dielectric optimization for inkjet-printed TIPS-pentacene organic thin-film transistors*", **Poster Presentation,** 2nd IEEE International Conference on Emerging Electronics (ICEE-2014), held at IISc. Bangalore, India, during 4-6 December 2014.

2. **Subhash Singh** and Y. N. Mohapatra, "*Photoresponse in solution-processed organic thin-film transistor with polymer dielectric: Role of traps in controlling steady state and transient characteristics***", Oral Presentation,** 8th International Conference on Materials for Advanced Technologies of the Materials Research Society of Singapore & 16th International Union of Materials Research Societies, International Conference in Asia (ICMAT 2015 & IUMRS-ICA 2015), held at Suntec, Singapore, during 28 June-03 July 2015.
3. **Subhash Singh** and Y. N. Mohapatra, "*Trap signature in solution-processed organic thin film transistors: Nature of current transients on pulsing gate voltage*", **Poster Presentation,** 18thInternational Workshop on Physics of Semiconductor Devices (IWPSD-2015), held at IISc. Bangalore, India, during 7-10 December 2015.
4. **Subhash Singh** and Y. N. Mohapatra, "*White Light Photoresponse in TIPS-Pentacene based Organic Thin Film Transistors (OTFTs): Occurrence of Persistent Photocurrent (PPC)*", **Poster Presentation (Best Poster Award),** International Conference on Materials Engineering (ICME 2017), held at I.I.T Kanpur, India, during 2-4 June 2017.
5. **Subhash Singh** and S. B. Majumder, "*Synthesis, Characterization and Liquefied Petroleum Gas (LPG) Sensing Properties of WO_3 Nano-Particles*", **Poster Presentation,** 2nd International Conference on Condensed Matter & Applied Physics (ICC-2017), held at Govt. Engineering College, Bikaner, (Rajasthan) India, during 24-25 November 2017.
6. **Subhash Singh** and Y. N. Mohapatra, "*Degradation and bias-stress effect in TIPS-pentacene based organic thin film transistors with polymer dielectric*", **Poster Presentation,** 19th International Workshop on Physics of Semiconductor Devices (IWPSD-2017), held at IIT Delhi, India, during 11-15December 2017.
7. **Subhash Singh** and Y. N. Mohapatra, "*Organic Semiconductors and Devices: OTFT as a case study*", **Oral Presentation,** Research Scholar Day, Materials Science Programme (March, 2016), I.I.T Kanpur, India.
8. **Subhash Singh** and Y. N. Mohapatra, "*Fabrication and Characterization of Organic Thin Film Transistors: Role of traps*", **Oral Presentation (Best Presentation Award),** Research Scholar Day, Materials Science Programme (February, 2017), I.I.T Kanpur, India.
9. **Subhash Singh,** participated as a **volunteer** in 16th International Workshop on Physics of Semiconductor Devices (IWPSD-2011), held at I.I.T Kanpur, India, during 19-22 December 2011.

10. **Subhash Singh,** "Flexible Inkjet-Printed Organic Thin Film Transistors: Device fabrication, characterization and logic circuit applications", **Invited Talk** on "International Conference on Materials Science and Applications (ICMSAA)" held at Central University HNBGU, Srinagar Garhwal, India, during 26-28 October 2019.
11. **Subhash Singh,** "Organic thin film transistors and circuits on flexible substrates", **Invited Talk** on "International Conference on Recent Advances in Materials Science (ICRAMS-2021)" held at Central University HNBGU, Srinagar Garhwal, India, during 15-17 May 2021.
12. **Subhash Singh,** "Thin film device fabrication on flexible substrates for sensors", **Invited Talk** on "AICTE sponsored advanced FDP on Innovations and challenges of wearable electronics especially in the Sensors/Antenna domain", held at Defence Institute of Advanced Technology, Pune, India, during 09-10 January 2025.

Present Status: Presently I am working as an Assistant Professor in the department of Physics at National Institute of Technology, Bhopal since January 04th 2024. Before this I was Senior Research Associate at Indian Institute of Science Bangalore. Previously, I was in the University of Pisa, Italy, and work on CNT and 2D materials based Thin Film Transistors and circuits on glass/paper substrate using high dielectric constant solution-processed/inkjet-printed Al_2O_3. Before this, I was a Postdoctoral Research Fellow at Yamagata University, Japan and worked on Inkjet-printed flexible OTFT devices for various applications. Understand the charge transport mechanisms in these devices also an important part of this project. My role in the project is (i) Device fabrication, and (ii) research paper writing, as well as guide master students.

At present we mainly focused on various solution-processed techniques such as inkjet-printing, reverse offset printing, screen printing, and roll-to-roll printing, spin-coating and drop casting is also a part of fabrication techniques. I do it for various electrode printing as well as OTFT fabrication. Printing techniques were widely used in our centre (Centre for Organic Electronics, Yamagata University Japan) for other device fabrications such as solar cell, OLED, and various chemical and biological sensors. Apart from various printing techniques we used thermal deposition for metal and other dielectric materials.

ACHIEVEMENTS

- Awarded by **SERB-National Postdoctoral Fellowship (N-PDF)** on February 2019 at Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR) Bangalore, India.

- Published **FOURTEEN** research papers as author and co-author and presented more than **ELEVEN** papers in various international workshop and conferences.
- Qualified for **National Eligibility Test (NET) in Physics** conducted jointly by the Council of Scientific and Industrial Research (CSIR) and University Grant Commission (UGC), India.
- Qualified **Graduate Aptitude Test in Engineering (GATE) in Physics** conducted by Ministry of Human Resource and Development, India.
- **DORA Institute Travel Award** to attend International Conference on Materials for Advanced Technologies (ICMAT) of the **Materials Research Society of Singapore, Suntec, Singapore, July 2015.**

PROFESSIONAL SKILLS

Thin Film Deposition:

- Inkjet printing, Screen printing, Reverse offset printing, Spin-coating, Drop-casting, and Thermal deposition.

Thin Film Characterization Techniques:

- Absorption spectroscopy, Photo-luminescence spectroscopy, Thickness measurements, Optical microscopy, Scanning electron microscopy, and Atomic force microscopy.

Device Fabrication (within a Class 1000 clean environment)

- Single- and multi-layered, sandwich- and planar-type device structures such as Light-emitting diodes, Solar-cells and Thin-film transistors by using both polymeric and small molecule organic semiconductors via various printing techniques.

Device Characterization Techniques

- Current density-voltage, Impedance spectroscopy, Capacitance-Voltage measurements, Photo-voltage and photo-current transient, Drain current transients and Temperature dependent measurements.

Data Analysis Software

Origin Pro 8.5, Autocad, C++ and MATLAB.

EXTRA CURRICULAR ACTIVITIES& LEADERSHIP QUALITY

- Laboratory and Assignments Tutor in the course ESO-205 "Nature and Properties of Materials" (2013-2014, Semester-I) for B. Tech. (2^{nd} year and 3^{rd} year) students, Indian Institute of Technology Kanpur, Kanpur, INDIA.
- Volunteer for "Flexible Electronics" summer course held at Semtal Centre for Display Technologies, July 2014, Indian Institute of Technology Kanpur, Kanpur, INDIA.
- Teaching Assistantship (TA) for graduate seminar course (Materials Science Programme, 2011-2015), Indian Institute of Technology Kanpur, Kanpur, INDIA.
- Volunteer for IWPSD conference December 2011, Indian Institute of Technology Kanpur, Kanpur, INDIA.
- Hall Executive Committee (HEC) member (Library Secretary, Hall X), 2012-13, Indian Institute of Technology Kanpur, Kanpur, INDIA.
- Hall Executive Committee (HEC) member (Reading Room Chairman, Hall IV), 2015-16, Indian Institute of Technology Kanpur, Kanpur, INDIA.