

BALPARTAP SINGH

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EDUCATION

Doctor of Philosophy, Materials Engineering, Indian Institute of Science, Bengaluru, GPA: 8.6	Jan 2023 – Present
Bachelor of Technology, Textile Technology, Indian Institute of Technology Delhi, GPA: 8.22	Aug 2018 – May 2022

RESEARCH WORK

Multidimensional 3D-2D Perovskite for Photovoltaics: The work focuses on ligand-engineered 2D perovskite dynamics and on understanding the 3D-2D halide perovskite interface, with the aim of improving the optoelectronic device's performance.

Coursework: Optical Materials and Devices, Organic Electronics, Solar Devices, Electron Microscopy, and Materials Synthesis: Quantum Dots to Bulk Crystals

AWARDS AND ACHIEVEMENTS

- 2026 Oral Presentation Award:** Best Research Presentation at the 39th Annual Students' Symposium held at the Department of Materials Engineering, IISc Bangalore
- 2025 Oral Presentation Award:** Best Research Presentation at the 38th Annual Students' Symposium held at the Department of Materials Engineering, IISc Bangalore
- 2024 Best Poster Award:** Poster Presentation titled "Structural Rigidity Dictates the Structural and Carrier Dynamics in 2D Lead Halide Perovskites" at the International Conference on Hybrid Perovskites-2024 held at NISER Bhubaneswar
- 2023 Prime Minister Research Fellowship:** The Prime Minister's Research Fellowship (PMRF) is India's most prestigious scholarship program that aims to attract talented students to pursue research in cutting-edge science and technology fields.
- 2019 REX Karmaveer Global Fellowship and Karmaveer Chakra Award:** The fellowship aims to mentor young leaders to understand the value of character-rooted leadership. Awarded for contributing to Girl Up Wings, Delhi Chapter, which aimed to strengthen underprivileged girls through teaching life skills.

PUBLICATIONS

- Singh, B.;** Saykar, N. G.; Kumar, B. S.; Afria, D.; C. K., S.; Rondiya, S. R. *Unraveling Interface-Driven and Loss Mechanism-Centric Phenomena in 3D/2D Halide Perovskites: Prospects for Optoelectronic Applications.* *ACS Omega* **2024**, *9* (9), 10000-10016.
- Singh, B.;** Gupta, A.; Singh, D.; Shukla, S.; Vásárhelyi, L.; Szenti, I.; Kukovecz, A.; Rawal, A. Structural Health Monitoring of Nonwoven Materials via Self-Similar Arrays of Carbon Nanotubes. *Composites Communications* **2022**, *32*, 101155.
- Rahane, G. K.; **Singh, B.;** Roy, A.; Saykar, N. G.; Mandal, A.; Afria, D.; Jadhav, Y. A.; Mali, S. S.; Dzade, N. Y.; Rondiya, S. R. *Tailoring Interface via Tuning the Phase and Morphology of TiO₂ for Efficient Mesoporous Perovskite Solar Cells.* *Langmuir* **2024**, *40* (43), 22526-22539.
- Saykar, N.; **Singh, B.;** Potla, Y.; Pal, B.; Ghosh, S.; Rondiya, S.R. *Phase distribution in Quasi 2D Dion Jacobson Perovskite Dictates Ultrafast Charge Build-up and Directional Charge Transfer.* *Adv Materials Inter* **2025**, e00108
- Jagadish, K.; Godha, A.; Pandit, B.; Jadhav, Y.; Dutta, A.; Satapathy, J.; Bhatt, H.; **Singh, B.;** Makineni, S. K.; Pal, S.; Rondiya, S. R. *Charge Carrier Dynamics in Bandgap Modulated Covellite-CuS Nanostructures.* *Small* **2024**, 2405859.

6. Jena, S.; **Singh, B.**; Sadhanala, A.; Rondiya, S. R. Harnessing Excited-State Energy Transfer for the Activation of Dark Triplet Excitons and Phosphorescence in Hybrid Organic-Inorganic 2D Perovskite. *ACS Materials Lett.* **2025**, *7* (8), 2996-3001.
7. Nath, B.; Panchal, A.; Kumar, J.; **Singh, B.**; C K, S.; Rondiya, S. R.; Ramamurthy, P. C. Low-Temperature-Processed Flexible Perovskite Solar Cells: Performance Analysis and Stability Dynamics. *ACS Appl. Energy Mater.* **2025**, *8* (23), 17297-17310.
8. Schiller, Ulf, et al. "Experimental and numerical analysis of the impact of decontamination treatments on the filtration performance of N95 respirators." *APS March Meeting Abstracts*. Vol. **2022**, pp. W10-002. **2022**

CONFERENCES

Organizing Committee Member: International Conference on Advanced Characterization Techniques (ACT-2023) (Online), conducted on 18th August 2023 at the Indian Institute of Science, Bangalore. <https://www.act-2023.com/>

Conference Attended

1. Device Physics Characterization and Interpretation in Perovskite and Organic Materials (DEPERO), 3-5th October, 2023 (Online)
2. Molecularly Designed Functional Materials 2023 (MDFM 23), 28-30th September, 2023 (Online)
3. International Conference on Hybrid Perovskites (HyPe-24) at NISER Bhubaneswar, 20-22nd December, 2024

UNDERGRADUATE RESEARCH

Structural Health Monitoring of Nonwoven Materials via Self-Similar Arrays of Carbon Nanotubes

(Prof. Amit Rawal, IIT Delhi, Prof. Ákos Kukovecz, University of Szeged, Hungary)

Aug 2021 – Apr 2022

Engineered statistical self-similarity in glass fiber-based nonwoven and functionalized multiwalled CNTs (f-MWCNTs) | Examined strain sensing using custom-designed benchtop stretching assembly | Demonstrated fractal nature of f-MWCNTs

Auxetic Behavior of Buckypaper through Coarse-Grained Molecular Dynamics Simulations

(Prof. Amit Rawal, IIT Delhi, Prof. Ulf D. Schiller, Clemson University)

May 2021 – July 2021

Developed bead spring models for single-walled and double-walled CNT buckypaper | Formulated simulation scripts for LAMMPS | Modelled characteristic pair-potentials demystifying buckypaper behavior under tensile strain

Analyzing Parallel Combination of Lock-In-Amplifiers (Prof. Madhusudan Singh, IIT Delhi)

May 2019

Graphical flow with LabVIEW application programming interface | Extracted real-time data from lock-in-amplifiers

WORK EXPERIENCE

Junior Research Fellow

IIT Delhi

June 2022 – Aug 2022

New Delhi, Delhi

Theoretical modelling of sustainable nonwoven-based Gas Diffusion Layers in PEM Fuel Cells for compression-recovery behavior | Fabricated C-fiber/PA6 reinforced conductive nonwoven composites |

TECHNICAL SKILLS

Application Software	MATLAB, LAMMPS, Visual Molecular Dynamics, LaTeX, Blender, FullProf Suite, Nanoscope
Modelling and Analysis	MS Excel, Origin, OVITO, Python, Design Expert, ImageJ
Experimental Techniques	Perovskite Device Fabrication, Hot Injection Synthesis, Hydrothermal Synthesis, Single Crystal Synthesis, Vacuum Filtration, Thermal Evaporation Deposition

Hands-on Tools

X-ray diffraction, FE-SEM, EDS Mapping, UV-visible spectroscopy, Raman Spectroscopy, Focused Ion Beam, Time-resolved Photoluminescence, Solar Simulator, Impedance Spectroscopy