



Dr.
ARNAB
KANTI
KARAN

CONTACT

+918910738200

+918910738200

arnabkantikaran13@gmail.com
akkaran.physics@gmail.com

<https://www.researchgate.net/profile/Arnab-Karan>

www.linkedin.com/in/arnab-karan-393167344

<https://scholar.google.com/citations?user=zjt->

<https://orcid.org/0000-0001-6960-1304>

SHORT RESUME

I have completed my PhD in Materials Science / Applied Physics from the Department of Physics, Jadavpur University. My research focuses on functional and Organic dye-based electronic materials, device-oriented optoelectronic applications. As a first and corresponding author, I have published research articles in peer-reviewed journals, particularly in the areas of materials-device interfaces, charge transport phenomena, and photodetector technologies. My research integrates experimental fabrication and characterisation of thin films and nanoscale devices with advanced computational modelling using DFT. My current research interests include quantum tunnelling-based temperature-independent photodetectors, energy harvesting materials, and reliable electronic devices for harsh environments.

ACADEMIC QUALIFICATION

October 2019 – November 2025

Doctor of Philosophy in Physics.

Condensed Matter Physics Research Centre, Jadavpur University, 188, Raja Subodh Chandra Mallick Rd, Jadavpur, Kolkata, West Bengal 700032

2015 – 2017

Master Of Science in Physics.

Techno India University Kolkata, EM Block, Sector V, Bidhannagar, Kolkata, West Bengal 700091
CGPA- 8.08

RESEARCH EXPERIENCE

September 2019 – November 2025

Doctor of Philosophy in Physics

Condensed Matter Physics Research Centre, Jadavpur University, 188, Raja Subodh Chandra Mallick Rd, Jadavpur, Kolkata, West Bengal 700032, India

Research Topic:-

- Thesis title (Influence of Nanoparticles and Carbon Nanotubes on Electrical Characteristics of Natural and Organic Dye-based Cell)

- Introduction (The study of the effect of nanoparticles and carbon nanotubes on the semiconducting properties of organic dye-based cells is crucial for advancing the performance and efficiency of next-generation photovoltaic and optoelectronic devices. Nanoparticles and carbon nanotubes, due to their unique electrical, optical, and structural properties, can significantly enhance charge transport, light absorption, and overall stability within these cells. By integrating these nanomaterials, it becomes possible to overcome limitations such as low charge mobility and rapid recombination of charge carriers commonly associated with organic dyes. This research not only helps in optimising the energy conversion efficiency of dye-sensitised solar cells but also opens pathways for developing flexible, lightweight, and cost-effective solar technologies. Furthermore, understanding these effects provides insight into tailoring material interfaces and electronic interactions at the nanoscale, which is essential for the design of high-performance organic electronic devices.)

Extra Research Activity:-

- Led-Free Perovskite-based Opto-Electronic devices.
- rGo-Polymer nano composite for Gas sensing and High Dielectric Application.
- Perovskite-based devices for Memory switching applications

ARTICLES PUBLISHED

- **A.K. Karan***, D. Sahoo, N.B. Manik, Enhanced photoelectric performance of sunset yellow dye-zinc oxide composed solar cells, **Materials Letters**. 402. **2025**. [Link](#).
- D. Sahoo*, **A.K. Karan**, N.B. Manik, MWCNT-Enhanced Cs₂SnCl₆ Perovskite for Improved Charge Transport in a Smartphone-Interfaced UV Photodetector, **ACS Applied Electronic Materials** 7, 9, 4391–4402, **2025**. [Link](#).
- S. Rakshit*, **A.K. Karan**, N.B. Manik, Investigation of the effect of single walled carbon nanotube (SWCNT) on semiconducting properties of turmeric dye based Schottky device: a space charge limited conduction approach, **Journal of Materials Science: Materials in Electronics** 36, 821, **2025**. [Link](#).
- A. Samanta, M. Shit, **A.K. Karan**, N.B. Manik, C. Sinha*, S. Khanra, Zn(II)-based 2D coordination polymer bridged by isophthalate and Dipyridylsulphide : Structural characterisation, Schottky diode device and theoretical interpretation. **Journal of Molecular Structure**. 1321. 2. **2024**. [Link](#).
- S. Rakshit*, **A.K. Karan**, N.B. Manik, Enhanced Electrical Transport Properties of Beetroot Dye-Based Thin Film in Presence of Titanium Dioxide Nanoparticles, **J Electron Mater** 53. 3914–3925. **2024**. [Link](#).
- **A.K. Karan***, D. Sahoo, S. Sen, S. Rakshit, S. Bhunia, N.B. Manik, Estimation of activation energy of Tartrazine dye based natural organic device, **AIP Conf Proc, American Institute of Physics**, **2024**. [Link](#).
- **A.K. Karan***, D. Sahoo, S. Sen, S. Rakshit, N.B. Manik, Modification of barrier height inhomogeneity in the presence of titanium dioxide nanoparticles on Carmoisine dye-based Schottky device, **Surfaces and Interfaces** 46. **2024**. [Link](#).
- M. Shit, **A.K. Karan**, S. Maity, A.M.Z. Slawin, N.B. Manik, B. Dutta, C. Sinha*, Succinato-bridged Cd(II)-nicotinylhydrazone 3D coordination polymer: structure, photoconductivity and computational studies, **J Coord Chem** 77. 142–154. **2024**. [Link](#).
- M. Shit, S. Halder, K. Manna, **A.K. Karan**, A. Samanta, N.B. Manik, S. Pal, K. Jana, C. Sinha*, Mn(II) 3D Coordination Framework with Mixed 5-Aminoisophthalato and Pyridyl-isonicotinoyl Hydrazone Bridges: Structure, Electrical Conductivity, Anticancer Activity, and Drug Delivery, **ACS Appl Polym Mater** 6. 2637–2648. **2024**. [Link](#).
- **A.K. Karan***, D. Sahoo, S. Sen, S. Rakshit, S. Bhunia, N.B. Manik, Estimation of activation energy of Tartrazine dye based natural organic device, **AIP Conf. Procee.** 3067. 020023. **2024**. [Link](#).
- **A.K. Karan***, D. Sahoo, N.B. Manik, Investigating the effects of TiO₂ nanoparticles on the barrier inhomogeneity of brilliant-blue fruit dye-base solar cell, **Current Applied Physics**. 59. 95-104. **2023**. [Link](#).
- **A.K. Karan***, D. Sahoo, N.B. Manik, Enhanced electrical conductivity and charge conduction mechanisms in Nano-cubical Sunset Yellow dye incorporated with titanium dioxide nanoparticles, **Physica B Condens Matter** 674. **2023**. [Link](#).
- D. Sahoo*, Payel Sengupta, **A.K. Karan**, N.B. Manik, Improvement in conductivity of lead-free CH₃NH₃SnI₃ perovskite thin film using multi-walled carbon nanotubes as a transporter, **Surfaces and Interfaces**. 10.1060. **2023**. [Link](#).
- **A.K. Karan***, D. Sahoo, S. Sen, N.B. Manik, Electrical conduction mechanism of carmoisine dye-based natural organic device, **Indian Journal of Physics**. 98.577–583. **2024**. [Link](#).
- **A.K. Karan***, Effect of Titanium-Dioxide nanoparticle on Richardson Constant and Barrier Height of Tartrazine Dye based Schottky Device, **Discov Mater**. 0–11. **2023**. [Link](#).
- D. Sahoo*, **A.K. Karan**, N.B. Manik, Influence of SWCNT on the Electrical Behaviour of an Environmentally Friendly CH₃NH₃SnI₃ Perovskite-Based Optoelectronic Schottky Device, **ACS Appl Electron Mater**. **2023**. [Link](#).
- D. Sahoo*, **A.K. Karan**, Z. Mallick, N.B. Manik, Synthesis and complex impedance analysis of nano cubic CH₃NH₃SnI₃ perovskite for the development of optoelectronic lead-free Schottky diode, **Mater Sci Semicond Process** 155. **2023**. [Link](#).
- D. Sahoo*, **A.K. Karan**, N.B. Manik, Electrical charge transport properties of caesium tin chloride perovskite microrods: An analysis of microstructure conductivity and charge trapping, **Mater Lett** 339. **2023**. [Link](#).
- M. Shit, **A.K. Karan**, D. Sahoo, N.B. Manik, B. Dutta, C. Sinha*, Strategy for the improvement of electrical conductivity of a 3D Zn(ii)-coordination polymer doubly bridged by mesaconato and pyridyl-isonicotinoyl hydrazide based Schottky diode device, **New Journal of Chemistry** 47. 5922–5929. **2023**. [Link](#).
- **A.K. Karan***, S. Bhunia, N.B. Manik, Study on the Conductivity of a Sunset Yellow Dye-Based Natural Organic Device, **J Electron Mater** 51. 7156–7163. **2022**. [Link](#).

SEMINAR/CONFERENCE ATTENDED

- Highly Efficient Photo-Electric Behaviour of Carnosine-based Synthetic DSSC incorporated with Zinc-Oxide Nanoparticles, **32nd National Conference on Condensed Matter Days (CMDAYS-2024)**, A. K. Karan, D. Sahoo, N. B. Manik, **2024**.
- Investigating the Influence of Titanium Dioxide Nanoparticle Doping on the Polaron Hopping Distance in Cells Utilizing Tartrazine Dye, **4th International Conference on Material Science (ICMS-2024)**, A. K. Karan, D. Sahoo, N. B. Manik, **2024**.
- Improved Conductivity through Barrier Inhomogeneity Modification via TiO₂ Nanoparticle Integration in Sunset Yellow Dye-Based Schottky Diode, **31st National Conference on Condensed Matter Days (CMDAYS-2023)**, A. K. Karan, D. Sahoo, N. B. Manik, **2023**.
- Modification of Richardson Constant and Interfacial Potential in presence of Titanium Dioxide nanoparticles on Carmoisine Dye Based Device, **7th International Conference on Nanoscience and Nanotechnology (ICONN-2023)**, A. K. Karan, D. Sahoo, S. Sen, S. Rakshit, N. B. Manik, **2023**.
- Estimation of Richardson Constant and Barrier Inhomogeneity in presence of Titanium Dioxide nanoparticle on Fruit Dye based Organic Schottky device using Tartrazine Dye, **30th National Conference on Condensed Matter Days (CMDAYS-2022)**, A. K. Karan, D. Sahoo, S. Sen, S. Rakshit, N. B. Manik, **2022**.
- Evaluation of Richardson Constant of Fruit dyes using Carmoisine and Tartrazine, **International Conference on Advanced Physics (IEMPHYS-2022)**, A. K. Karan, D. Sahoo, S. Sen, N. B. Manik, **2022**.
- Effect of Titanium-Dioxide nanoparticle on Richardson Constant of Sunset Yellow dye-based Cell, **International Conference on Nanotechnology (ICNT-2022)**, A. K. Karan, D. Sahoo, S. Sen, N. B. Manik, **2022**.
- Estimation of Activation Energy of Tartrazine Dye based Natural Organic Device, **4th International Conference on Current Trends in Materials Science & Engineering (CTMSE 2022)**, A. K. Karan, D. Sahoo, S. Sen, S. Rakshit, S. Bhunia, N. B. Manik, **2022**.
- Study on the Conductivity of Natural Organic Dye-based Device Using Tartrazine Dye, **International Conference on Recent Trends in Green Chemistry (ICRTGC-2021)**, A. K. Karan, D. Sahoo, N. B. Manik, **2021**.
- Estimation of Richardson Constant for Natural Organic dye Based Cells using Orange-lemon and Apple-green, **3rd International Conference on Current Trends in Materials Science & Engineering (CTMSE 2021)**, A. K. Karan, N. B. Manik, **2021**.
- Effect of Titanium-Di-Oxide (TiO₂) on Malachite Green Dye-based Organic Diode, **National Seminar on New Directions in Physical Sciences 2020**, Subhra Rakshit, A. K. Karan, D. Sahoo, N. B. Manik, **2020**.

EXPERTISE PORTFOLIO

Experimental:-

- **Crystal Growth:** Experienced in synthesising of high-quality polycrystalline samples of intermetallic and organic compounds using arc melt and solid-state reaction techniques.

- **Structural Characterisation:**

X-ray diffraction (Experiment, analysis and refinement)

SEM, EDX (Experiment, Analysis)

AFM (Experiment, Analysis)

- **Electric Properties:** (Conductivity, Barrier Height Inhomogeneity, Distribution of Traps) Keithley 2400 source meter with input programming, LCR METER IM3536,

- **Photo-Voltaic Properties:** (Spectral Response, Fill Factor, Power Conversion Efficiency, Absorption Coefficient, Lifetime) DSU-Solar Simulator, Agilent Data logger with input programming

- **Spectroscopic Properties:**

Raman Spectroscopy (Crystalline Structure, Phase, and Defects)

X-ray Photoelectron Spectroscopy (Elemental Composition & State, Uniformity, and Composition)

Ultraviolet Photoelectron Spectroscopy (Density of States, Work function, Electronic Defects)

Nuclear Magnetic Resonance Spectroscopy (Arrangement of Atoms, Phase)

Fourier Transform Infrared Spectroscopy (Bond Information)

- **Magnetic Properties:** VSM magnetometer (DC-magnetic Susceptibility, Magnetisation)

- **Transport Properties:** (Resistivity, Magnetoresistance, Polaron Hopping, Fermi Energy),

- **Thermodynamic properties:** (Heat Capacity)

Theoretical:-

- DFT analysis (Quantum Espresso)

SKILLS

- **Coding** (C-Programming, Fortran programming, DBMS, Arduino Programming)
- **Software** (Quantum Espresso, SCAPS, HighScore Plus, Expo-2019, CambridgeSoft ChemDraw Ultra 12.0, Omnic-2019, VESTA-2019, Origin-2021)
- **Instrumentation** (Electronic Circuits, Arduino CKT, Cryostat)
- **Instrument Handling** (SHIMADZU Ultraviolet-Visible spectrophotometer (UV-1900), BRUKER FESEM & EDX (Quantax, 200), Hioki LCR Q meter (IM3536), Vibrating Sample Magnetometer (VSM), TGA/DTA, Keithley 2400 source Meter, Bruker D8 SWAX diffractometer, SMU-200 Solar Simulator)

EXTRACURRICULAR ACTIVITIES

- **Singing** (Senior Diploma in Classical Music, Junior Diploma in Rabindra Sangeet, Junior Diploma in Najrul Geeti)
- **Recitation**
- **Computer Science** (Cita course from Youth Computer Training, B.Sc. General (Computer Sc.) degree from Kharagpur College)

HOBBIES

Singing, Recitation, Gardening, Playing Games (Outdoor & Indoor), Photography, Exploring Nature, Wildlife Camping, Reading Books.