ABHISHEK ANAND

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EDUCATION

Direct Ph.D. (MS + Ph.D.), Chemical Engineering (CGPA: 8.24)
Indian Institute of Technology Madras, India | Sep 2020 – July 2025
Thesis title: Magnetic Field-Assisted Photoelectrochemical Water Splitting: Mechanistic Insights and Performance Enhancement.
Thesis advisors: Prof Aravind Kumar Chandiran

Bachelor of Technology - Chemical Engineering (CGPA: 8.85)
Sardar Vallabhbhai National Institute of Technology Surat, India | Jul 2016 – May 2020
Dissertation title: Process Design of Methylamine Production Unit.
Thesis advisors: Prof Aravind Kumar Mungray

RESEARCH EXPERIENCE

Manager, Cell R&D at **Battery Innovation Centre, OLA Electric**
July 2025 - Present | Bangalore, India

- Working with the R&D team on electrolyte formulation and validation for Li-ion cells (NMC, LFP), optimizing performance across coin, cylindrical, and pouch cell formats using advanced electrochemical testing, including cycling protocols, rate capability, HPPC, and EIS.
- Conducting failure analysis and post-mortem diagnostics to identify degradation mechanisms (SEI/CEI instability, lithium loss, impedance growth, gas evolution) and correlating electrochemical data with material characterization (CT, SEM, XRD, XPS, GC-MS, ICP-MS) to enable root-cause analysis.
- Developed end-to-end cell testing data analytics workflows, integrating Python-based web applications, Tableau dashboards, and SQL pipelines to enable automated data processing, visualization, and efficient decision-making.

Doctoral Assistant, Group of Prof Aravind Kumar Chandiran at Indian Institute of Technology Madras
Sep 2020 – Jun 2025 | Chennai, India

- Investigated performance enhancement of photoelectrochemical (PEC) water splitting system for hydrogen generation using halide perovskites, exploring charge transport, interfacial kinetics, and recombination dynamics under an applied magnetic field.
- Design and synthesis of inorganic-organic perovskites, transition-metal complexes, and nanomaterials, with a strong emphasizing improving material stability and enhanced photovoltaic and catalytic performance.
- Explored distortion- and polarization-driven light emission properties in halide perovskites, establishing structure-property relationships for optoelectronic applications.
- Developed a high-resolution transient photovoltage measurement system to probe charge carrier dynamics and recombination mechanisms in photovoltaic and PEC devices with precise temporal control.

Summer School Participant, Indo-German Centre for Sustainability, Technical University Berlin
July 2023 – Aug 2023 | Berlin, Germany

- Studied the integration of renewable energy sources into a power grid as a key contribution towards a carbon-neutral society.

Summer Research Internship, Group of Prof Basavaraja M Gurappa at Indian Institute of Technology Madras
Jun 2019 – Jul 2019 | Chennai, India

- Conducted research on emulsifying water in diesel with surfactants to decrease emissions and enhance fuel efficiency in IC engines.

Industrial Internship (Methylamines plant) at Rashtriya Chemicals & Fertilizers Limited, Thal
Dec 2018 – Dec 2018 | Thal, India

- On-site training on methylamine plant design and operation.

Winter Research Internship, Group of Prof Dr. Jignasa V. Gohel at S. V. National Institute of Technology Surat
Dec 2017 – Dec 2017 | Surat, India

- Worked on TiO_2 thin films deposition techniques, including vapor phase deposition, spray pyrolysis, and spin coating for perovskite solar cell application.

RESEARCH EXPERTISE

- **Material Synthesis:** Single crystals, nanostructured powders, thin-films by hydrothermal, co-precipitation, sol-gel, and solid-state synthesis (atmospheric and vacuum-sealed).
- **Material Deposition & Device Fabrication:** Thermal Evaporation, RF/DC Magnetron Sputtering, CVD (PECVD, LPCVD), ALD, Spin Coating, Doctor Blading, Electrodeposition
- **Material Characterization Techniques**: *Structural & morphological:* X-ray Diffraction (XRD), Scanning Electron Microscopy (SEM), Focused Ion Beam Scanning Electron Microscopy (FIB-SEM), Electron Backscatter Diffraction (EBSD), Atomic Force Microscopy (AFM) | *Scanning Probe Functional Techniques:* Magnetic Force Microscopy (MFM), Piezoresponse Force Microscopy (PFM), Scanning Electrochemical Microscopy (SECM) | *Compositional / Elemental:* Energy Dispersive X-ray Analysis (EDAX/EDS), Inductively Coupled Plasma (ICP-MS/OES), Time-of-Flight Secondary Ion Mass Spectrometry (ToF-SIMS) | *Chemical State:* X-ray Photoelectron Spectroscopy (XPS), Fourier Transform Infrared Spectroscopy (FTIR), Raman Spectroscopy, Nuclear Magnetic Resonance Spectroscopy (NMR), Electron Paramagnetic Resonance Spectroscopy (EPR) | *Optical spectroscopy:* Optical Absorption Spectroscopy, UV-Visible (UV-Vis) Spectroscopy, Fluorescence Emission Spectroscopy (PL), Time-Resolved Single Photon Counting (TRSPC), Confocal fluorescence microscopy | *Thermal:* Thermogravimetric Analysis (TGA), Differential Scanning Calorimetry (DSC) | *Magnetic:* Vibrating Sample Magnetometer (VSM), Physical Property Measurement System (PPMS) | *Analytical:* Gas Chromatography (GC-MS), Ion Chromatography (IC), Liquid Chromatography (LC), HF estimation, Karl Fischer (KF) titration.
- **Li-ion Battery**: End-to-end cell fabrication (coin, pouch, cylindrical, prismatic), Electrolyte formulation, SEI/CEI engineering and interface stabilization strategies, and performance optimization for NMC/LFP systems. Cycling/aging studies, failure analysis, and Battery forensics to investigate lithium loss, active material loss, impedance growth
- **Advanced Electrochemical Characterization**: Dielectric Spectroscopy (DS), Cyclic Voltammetry (CV), Linear Sweep Voltammetry (LSV), Electrochemical Impedance Spectroscopy (EIS), Galvanostatic Charge–Discharge (GCD/PCD), Galvanostatic/Potentiostatic Intermittent Titration Techniques (GITT/PITT), dQ/dV analysis, Rate capability, high-precision coulometry, charge transport, reaction kinetics, interfacial processes, and ion diffusion analysis.
- **Analytical Tools:** Mercury, Origin, Mendeley, EC-Lab, Vesta, CASA XPS, Z-View, Arduino, Tableau, Power BI.
- **Commercial Software:** LabVIEW, MATLAB, SolidWorks, Canva, MS Office.
- **Programming & Data Analysis:** Python (NumPy, Pandas, Matplotlib, SciPy), SQL
- Excellence in **English** oratory and written communication skills (patents, papers, reports, and proposals).

PATENTS

Granted

1. System for the Measurement of Polarization-Induced Charge Transfer in Optoelectronic and Photoelectrochemical Devices. V. Raj, **A. Anand,** A.K. Chandiran*. Indian patent number: 573358. Issued Nov 6, 2025*

Under Preparation

2. A System for Hydrogen Generation Using High-Intensity Solar-Driven Photoelectrochemical Cell with an Engineered Cell Architecture. K. Dharamthok, **A. Anand,** A.K. Chandiran.

PUBLICATIONS (PEER-REVIEWED)

Published

1. Sikarwar, P.; **Anand, A**.; Chandiran, A. K. Octahedral Distortion Induced Photoluminescence in $Cs_2NaIn_xBi_{1-x}Cl_6$ Halide Double Perovskites. ChemPhysChem 2025. https://doi.org/10.1002/cphc.202401036. (*Shared first author*)
2. Raj, V.; **Anand, A.**; Manoj, M.; Chandiran, A. K. Bipolaron hopping conduction in vacancy-ordered Cs2PtI6 perovskites. Dalton Transactions 2025. https://doi.org/10.1039/D5DT00726G

3. A.M., Aparna; **Anand, A.**; Rajput, S.; Chandiran, A. K. BaTeS3 Chalcogenide Perovskite-Based Photoanode for Photoelectrochemical Solar Water Oxidation. *ChemPlusChem* 2025. https://doi.org/10.1002/cplu.202500293
4. Halpati, J. S.; Manoj, M; **Anand, A.**; Chandiran, A. K. Magnetic Field-Induced Enhancements in the Photoelectrochemical Performance of Cs_2MnCl_6 Vacancy-Ordered Halide Double Perovskites. Journal of Physical Chemistry C 2026. https://doi.org/10.1021/acs.jpcc.5c08387

Under Preparation/review

5. **Anand, A.**; Halpati, J. S.; Chandiran, A. K. Enhanced photoelectrochemical performance of Cs_2RuX_6 (X: Cl, Br) in the external magnetic field.
6. **Anand, A.**; Chandiran, A. K. Photoelectrochemical Water Oxidation Performance Enhancement in Fe-doped $Cs_2AgInCl_6$ Halide Double Perovskites.
7. **Anand, A.**; Chandiran, A. K. Conductivity Mechanism in $Cs_2AgFe_xIn_{(1-x)}Cl_6$ Halide Double Perovskite.
8. **Anand, A**.; Sikarwar, P.; Chandiran, A. K. Blue Emitting Indium-Based Zero-Dimensional Organic-Inorganic Hybrid Halide Perovskite.
9. Raj, V.; **Anand, A.**; Chandiran, A. K. Temperature-Sensitive Polaron-Mediated Conduction and Relaxation in Cs_2RuX_6 Vacancy-Ordered Double Halide Perovskites. *(Shared first author)*
10. Sikarwar, P.; Siwach, P.; Rajput, S.; Anand, A.; Raj, V.; Antharjanam, S.; Chandiran, A. K. Non-Centro-Symmetric Antimony-Based Organic-Inorganic Hybrid Halides for Broadband White Light Emission with 13.1% Room Temperature Photoluminescence Quantum Yield.

TRAINING & CERTIFICATIONS

- Crystallography and Structural Refinement at the Department of Physics, IIT Madras (Apr 2023)
- Gas Chromatography-Mass Spectrometry (GC-MS) at Sophisticated Analytical Instrument Facility, IIT Madras (Feb 2023)
- Single Crystal XRD Data Analysis at Sophisticated Analytical Instrument Facility, IIT Madras. (Oct 2022)

TEACHING EXPERIENCE

Teaching Assistant, Department of Chemical Engineering, Indian Institute of Technology Madras

- Principles of Solid and Surfaces (CA5020), Jul – Nov 2024
- Heat and Mass Transfer Lab II (CH3521), Jan – May 2024
- Solar Photoelectrochemistry (CH5022), Jul – Nov 2023
- Chemical Thermodynamics lab (CH2016), Jan – May 2023
- X-Ray Diffractometer, Jul – Nov 2022
- Chemical Thermodynamics lab (CH2016), Jan – May 2022
- Mathematical Methods for Chemical Engineers (CH5520), Jul – Dec 2021

CONFERENCES

- Poster presentation entitled “Magnetic Field-Assisted Photoelectrochemical Water Splitting: Mechanistic Insights and Performance Enhancement” at the 3rd International Online Workshop on Lead-Free Perovskite Solar Cells organized by Helmholtz Center Berlin for Energy and Materials (HZB). (Oct 2025)
- Poster presentation entitled “Magnetic Field-Induced Improvements in Photoelectrochemical Activity of Cs_2RuX_6 (X: Cl, Br) Halide Perovskites” in E-MRS (European-MRS) Spring Meeting in Strasbourg, France (May 2025)
- Poster presentation entitled “Magnetic Field Enhanced Photoelectrochemical Performance of Halide Perovskite Cs_2RuX_6 (X: Cl, Br)” in Materials for Sustainable Development Conference (MATSUS Fall 24) at EPFL, Lausanne, Switzerland. (Nov 2024)
- Poster presentation entitled “Solar Water Oxidation using Cs_2RuX_6 Vacancy Ordered Halide Double Perovskites” in the International Conference on Photophysics and Photochemistry (ICOPP) 2024 at IIT Bombay. (Oct 2024)
- Attended “The International Conference on Green Hydrogen 2024” at the Bharat Mandapam, New Delhi. (Sep 2024)
- Poster presentation entitled “Enhanced Photoelectrochemical performance of Cs_2RuX_6 (X: Cl, Br) in External Magnetic Field” in the Research Symposium at IIT Madras. (May 2024)
- Presentation entitled “Ruthenium Halide Double Perovskites and their Application in Solar Water Oxidation” in NMTE2A 2024 in an international conference at BITS Pilani Hyderabad. (Feb 2024)

- Poster presentation entitled "Hydrogen Valley Innovation Cluster in Tamil Nadu" in Energy Summit 2023 at IIT Madras. (Dec 2023)
- Attended "World Hydrogen Energy Summit 2023" at the Convention Center, New Delhi. (Oct 2023)
- Poster presentation entitled "Ruthenium Halide Double Perovskites and their Application in Solar Water Oxidation" in PSIM 2023 in Perovskite Society of India Meet (PSIM)-2023 at IIT Roorkee. (Mar 2023)
- Attended "Energy Summit 2022" organized by the Energy Consortium at IITM Research Park. (Dec 2022)
- Poster presentation entitled "Ruthenium Halide Double Perovskites and their Application in Solar Water Oxidation" in B:FAT 2020 international conference at IIT BHU. (Jul 2022)
- Attended "Energy Summit 2021" organized by the Energy Consortium at IITM Research Park. (Dec 2021)

PROJECTS

- **Grid-free Green Corridor:** Battery Energy Storage System (BESS) integrated with solar photovoltaic panels, multi-chemistry lithium-ion battery packs, a water electrolyzer for hydrogen production, and a fuel cell system, configured as a microgrid to power a dedicated section of the laboratory building.
- **Line Follower Bot:** IoT-enabled autonomous bot using IR sensors and an ATmega32 microcontroller.
- **Plant Health Monitor:** IoT-based smart irrigation system using an ATmega128 microcontroller for real-time monitoring of soil moisture, air humidity, temperature, and sunlight intensity.

EXTRA-CURRICULAR ACTIVITIES

- Media & Outreach team, All India Research Scholars' Summit (AIRSS), Mar 2025
- Media & Outreach team, Research Scholar Fest, IIT Madras, Dec 2024
- Technical Talks, All India Research Scholars' Summit (AIRSS), Mar 2024
- Design team, Research Scholar Fest, IIT Madras, Feb 2022
- Event team, Research Scholar Fest, IIT Madras, Feb – May 2022
- Placement & Internship Cell, IIT Madras, May 2021 – Apr 2022
- Editor, Hindi Cell, SVNIT, Feb 2017 – Apr 2020
- Organizing Head, Manoj Memorial Night Cricket Tournament, SVNIT, 4 editions, Dec 2016 – Jan 2020
- Alumni Cell, SVNIT, Jan 2018 – Apr 2020
- IGNIS, SVNIT, Mar – Apr 2017

PERSONAL DETAILS

- Date of birth: February 13, 1998
- Sex: Male
- Marital status: Single
- Language known: English, Hindi, Urdu
- Nationality: Indian

REFERENCES

Prof. Aravind Kumar Chandiran
Associate Professor, Department of Chemical Engineering
Indian Institute of Technology Madras
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Recognized: PhD advisor

Prof. Niket S. Kaisare
Professor, Department of Chemical Engineering
Indian Institute of Technology Madras
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Recognized: Head of the department