

Curriculum Vitae – Dr. Sudarshan Narayanan, Ph.D.,

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EDUCATION

Aug 2009 – Aug 2014 M.S., Ph.D. Materials Science, Carnegie Mellon University, Pittsburgh PA, USA

Aug 2005 – Jul 2009 B.Tech. Engineering Physics, Indian Institute of Technology (IIT) Madras, Chennai India

PROFESSIONAL/RESEARCH EXPERIENCE

Nov 2022 – **Assistant Professor**, Dept. of Sustainable Energy Engineering, IIT Kanpur, Kanpur, U.P., India

Current **Research Areas and interest:**

- **Energy Storage:** Engineering of electrode-electrolyte interfaces in Li- and Na-ion solid-state batteries; Li-S and Na-S chemistries, post Li-ion battery technologies
- **Large area thin films:** Low-cost, chemically durable transparent conducting coatings for glazing, optoelectronic applications
- **Building-Integrated Photovoltaics (BIPV):** Large-area transparent PV coatings

Apr 2020 – **Postdoctoral Research Assistant**, Dept. of Materials, University of Oxford, Oxford UK

- Oct 2022
- Characterisation of Li metal – solid electrolyte interfaces in solid-state batteries in collaboration with Nissan Motors Ltd. and SOLBAT consortium (Faraday Institution UK), for EV applications
 - Co-investigator in InnovateUK Faraday Battery Challenge £670,000 Research Grant – LiMHIT: Lithium Metal electrode High Throughput screening

Sep 2014 – **R&D Engineer**, Vitro Architectural Glass (Formerly PPG Industries Inc.), Pittsburgh PA, USA

- Nov 2019
- Lead Scientist for Sungate® 700 passive low-e coated glass product
 - Large area sputter-deposited functional coatings including TCOs (low-e, transparent, durable) for architectural façades and automotive windshields

Jan 2010 – **Graduate Research Assistant**, Dept. of Materials Science and Engineering

Aug 2014 Carnegie Mellon University, Pittsburgh PA, USA

- Investigated transparent conducting materials for flexible and printable electronics using Metal-polymer hybrid composite materials

RESEARCH SUPERVISION, TEACHING, AND MENTORING EXPERIENCE

Indian Institute of Technology Kanpur (IIT Kanpur), India

- **Project Supervision:** Postdoctoral Researchers – Current (2 – Project funded), Completed (1 – Institute PDF)
Ph.D. Scholars – Current (7, with 4 being co-supervised – MoE funded)
M.Tech. Theses – Current (3), Completed (4)
BTech-MTech Dual degree – Completed (1)
B.Tech UG Research – Completed (1)
Project Associates – Current (4)
- **Instructor:** Course: SEE612 Manufacturing of Energy Technologies (PG, Sem-II 2024-25, 2025-26)
- **Instructor:** Course: SEE602 Physics of Energy Materials (PG, Sem-I 2023-24, 2024-25, 2025-26)
- **Co-Instructor:** Course: SEE606 Electrochemical Energy Systems (PG, Sem-I 2024-25)
- **Co-Instructor:** Course: SEE613 Solar Photovoltaics (PG, Sem-II 2022-23, 2023-24)
- **Instructor:** Course: SEE605 Intro to Sustainable Energy Technologies Lab (PG, Sem-II 2022-23, 2023-24)

University of Oxford, UK

- **Senior Demonstrator:** Electrode Potentials Laboratory, Department of Materials (HT 2022)
- **Co-supervisor:** Part II/Master's students; mentoring D.Phil students (Pasta Group) (MT 2021 – TT 2022)

Carnegie Mellon University, USA

- **Invited Lecturer:** Course: 27-729 Solid State Devices for Energy Conversion (PG, Fall 2018)
Course: 27-100 Intro. to Materials Science and Engineering (UG, Fall 2017)

- *Teaching Assistant:* Graduate and undergraduate level courses on Solid State Devices, Semiconductor Nanostructures, Elect.-Mag.-Opt. Materials, Polymer Physics (Fall 2010 – Spring 2013)
- *Student Mentor:* UG, Summer REU and Senior year Capstone students within CMU, WVU and Rice universities (Spring 2010 – Spring 2013)

Sanskrita Bharati USA and UK

- *Course Teacher:* ACS-WASC accredited “SAFL” (Sanskritam As Foreign Language) program, a 3-year online distance education program for students of grades 8-12 in USA

PEER-REVIEWED PUBLICATIONS (*Last Five Years*)

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- V. A. Ranawade, D. K. Gorai, M. D. Singh, A. Shinde, K. S. Nalwa, R. K. Gupta, L. Sang*, **S. Narayanan***, "Pentavalent Ta-Substitution Enhances Ionic Conductivity and Critical Current Density in NASICON for Sodium-Ion Batteries", *J. Mater. Chem. A*, (2026), **14**, 8243-8256
 - A. V. Shinde, M. D. Singh, P. Thakur, V. Kushwaha, V. A. Ranawade, P. Yadav, R. K. Gupta, **S. Narayanan***, "Boosting Grain Boundary Ionic Conductivity in NASICON-Type Solid Electrolytes Through Vanadium Doping for Next-Generation Sodium Batteries", *Batteries & Supercaps*, (2026), **9**, e202500251
 - Nelofer, V. Gupta, K. Singh, M. D. Singh, K. S. Nalwa, **S. Narayanan***, R. Sarkar*, "Designing Fluorocarbon-Based Polymeric Electrolytes with High Cationic Transference Number for All-Solid-State Sodium-Ion Batteries", *Polymer*, **340**, pp 129210, (2025)
 - J. Nishanth, M. S. Khan, Manish, M. D. Singh, K. S. Nalwa, **S. Narayanan***, "RuO₂-Modified Sulfurized Polyacrylonitrile Composite Cathodes for Sodium-Sulfur Batteries with Enhanced Electrochemical Performance", *Energy Storage* **7**, e70259 (2025)
 - J. Nishanth, J. Shikhar, M. S. Khan, S. Sharma, K. S. Nalwa, **S. Narayanan***, "Enhanced Monoclinic Sulfur Loading on Carbon Fiber Matrices for Li-S Battery Cathodes via a Chemical Activation Pathway", *Future Batteries* **6**, 100083 (2025).
 - M. Burton, **S. Narayanan**, B. Jagger, L. F. Olbrich, S. Dhir, M. Shibata, M. J. Lain, R. Astbury, N. Butcher, M. Copley, T. Kotaka, Y. Alhara, M. Pasta, "Techno-economic assessment of thin lithium metal anodes for solid-state batteries", *Nature Energy* **10**, 135–147 (2025).
 - C. Bechteler, **S. Narayanan**, R. I. Todd, "Plasma formation during flash sintering of boron carbide – Part II: Effect on sintering and optimization of process variables", *Ceramics International* (2025) **51**, 3, 3370-3382.
 - J. Aspinall, K. Sada, H. Guo, S. Kotakadi, **S. Narayanan**, Y. A. Chart, B. Jagger, E. Milan, L. Brassart, D. Armstrong, M. Pasta, "Light Lithium Magnesium Alloy Anodes for Solid State Batteries", *Nature Communications* **15**, 4511 (2024).
 - H. Jin, M. D. Farrar, J. M. Ball, A. Dasgupta, P. Caprioglio, **S. Narayanan**, R. D. J. Oliver, F. M. Rombach, B. W. J. Putland, M. B. Johnston, H. J. Snaith, "Alumina Nanoparticle Interfacial Buffer Layer for Low-Bandgap Lead-Tin Perovskite Solar Cells" *Adv. Funct. Mater.* 2023, **33**, 2303012.
 - P. Vadhva, T. E. Gill, J. H. Cruddos, S. Said, M. Siniscalchi, **S. Narayanan**, M. Pasta, T. S. Miller, and A. J. E. Rettie, "Engineering Solution-Processed Non-Crystalline Solid Electrolytes for Li Metal Batteries", *Chemistry of Materials* (2023), **35**, 3, 1168–1176.
 - S. Kim, Y. A. Chart, **S. Narayanan**, M. Pasta, "Thin Solid Electrolyte Separators for Solid-State Lithium–Sulfur Batteries", *Nano Letters* (2022), **22**, 24, 10176–10183.
 - **S. Narayanan**, U. Ulissi, J. S. Gibson, R. S. Weatherup, M. Pasta, "Effect of current density on the solid electrolyte interphase formation at the lithium|Li₆PS₅Cl interface", *Nature Communications* (2022) **13**, 7237.
 - H. J. Lee, X. Liu, Y. Chart, P. Tang, J-G Bae, **S. Narayanan**, J. H. Lee, R. J. Potter, Y. Sun, and M. Pasta, "LiNi_{0.5}Mn_{1.5}O₄ Cathode Microstructure for All-Solid-State Batteries" *Nano Letters* (2022) **22** (18), 7477-7483.
 - **S. Narayanan**, J. S. Gibson, J. Aspinall, R. S. Weatherup, M. Pasta, "In situ and Operando characterisation of Li metal – solid electrolyte interfaces", *Current Opinion in Solid State and Materials Science*, (2022) **26**, 100978.
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- P. Tang, H. J. Lee, K. Hurlbutt, P. Y. Huang, **S. Narayanan**, C. Wang, D. Gianolio, R. Arrigo, J. Chen, J. H. Warner and M. Pasta, “Elucidating the formation and structural evolution of platinum single-site catalysts for the hydrogen evolution reaction” *ACS Catalysis*, 2022, **12**, 3173–3180.
- S. J. Turrell, H. J. Lee, M. Siniscalchi, **S. Narayanan**, M. Pasta, S. C. Speller and C. R. M. Grovenor, “Fabrication of thin solid electrolytes containing a small volume of an Li₃OCl-type antiperovskite phase by RF magnetron sputtering” *Materials Advances*, 2022, **3**, 8995–9008.
- J. S. Gibson, **S. Narayanan**, J. Swallow, P. K. Thakur, M. Pasta, T-L. Lee and R. S. Weatherup, “Gently Does It!: In Situ Preparation of Alkali Metal - Solid Electrolyte Interfaces for Photoelectron Spectroscopy”, *Faraday Discussions*, (2022) **236**, 267-287.
- H. J. Lee, B. Darminto, **S. Narayanan**, M. Diaz-Lopez, A. Xiao, Y. Chart, J. H. Lee, J. Dawson, M. Pasta, “Li-ion conductivity in Li₂OHCl_{1-x}Br_x solid electrolytes: grains, grain boundaries and interfaces”, *Journal of Materials Chemistry A* 10, (2022), **21**, 11574-11586.
- C. Doerrler, I. Capone, **S. Narayanan**, J. Liu, C. R. M. Grovenor, M. Pasta, P. S. Grant, “High Energy Density Single-Crystal NMC/Li₆PS₅Cl Cathodes for All-Solid-State Lithium-Metal Batteries”, *ACS Appl. Mater. Interfaces* (2021), **13**, 31, 37809–37815.

BOOKS/BOOK CHAPTERS/MONOGRAPHS (*Last Five Years*)

- **S. Narayanan**, L. Chandra, D. Jhahria (Editors), “Materials, Devices and Systems for Sustainability” (ISBN: 9789819672943), *Springer Singapore* (2025).
 - Book chapter: M. S. Khan, M. D. Singh, P. Singh, K. S. Nalwa, **S. Narayanan***, "Challenges in Solid-state Electrolyte-Based Batteries and the Roadmap to Commercialization", *Materials, Devices and Systems for Sustainability. IITK Directions (Springer)*, 9, pp 9-26, (2025)

PATENTS (*as lead inventor or inventor with major contribution – Last Five Years*)

- R. Arora, G. Singh, M. D. Singh, **S. Narayanan**, “Hard Carbon As Cathode Material For High Energy-density Li-O₂ Batteries And Method Thereof” – Indian Patent No. 202511045031, May 2025 – Pending
- V. Gupta, R. Sarkar, Nelofer, **S. Narayanan**, M. D. Singh, K. Singh, “Amphiphilic Graft Copolymer-based Solid-state Composite Electrolyte For Sodium-ion Batteries” – Indian Patent No. 574,524; Nov. 2025 – Issued
- Z. Ma, M. Griffin, A. P. Ganjoo, P. A. Medwick, **S. Narayanan**, A. Polcyn, “Low sheet resistance coating” – U.S. Patent No. 12,284,770 (2025) – Issued
- A. P. Ganjoo, P. Fisher, **S. Narayanan**, “Flash Annealing of Transparent Conductive Oxide and Semiconductor Coatings” – U.S. Patent No. 12,032,124 B2 (2024) – Issued
- A. P. Ganjoo, **S. Narayanan**, D. J. O’Shaughnessy, “Transparent conductive oxide having an embedded film” – U.S. Patent No. 10,650,935 B2 (2020) – Issued
- A. P. Ganjoo, **S. Narayanan**, J. J. Finley, P. A. Medwick, “Coated Article Having a Silicon Oxynitride and Silicon Oxide Topcoat” – U.S. Patent No. 10,479,724 B2 (2019) – Issued
- **S. Narayanan**, A. P. Ganjoo, A. D. Polcyn, “Heat-Treatable Coating with Blocking Layer Having Reduced Color Shift” – U.S. Patent Appl. No. US20220119934A1, Oct. 2021 – Pending
- A. P. Ganjoo, **S. Narayanan**, J. J. Finley, “Protective Layer Over a Functional Coating” – U.S. Patent Appl. No. US 20240412892A1, Dec. 2024 – Pending

SELECTED CONFERENCE PRESENTATIONS (*Last Five Years*)

- **Invited Talk**: “Interfacial engineering strategies for high-performance Li- and Na-ion solid-state batteries: Bridging safety, stability, and scalability” – ACS Spring 2026 – Atlanta, GA & Virtual, Mar 2026.

- **Invited Talk:** “Paving the Path to Energy Sustainability in India: Innovations in Energy Storage and Energy-Efficient Buildings” – New Construction Technology And Green Initiative Seminar Conducted By Indian Army, Bhopal, India, Feb 2025.
- **Invited Talk;** “Materials and Chemistries for Next-generation Li-/Na-ion Batteries Towards EV and Grid-storage Applications” – Newcastle University-IIT Bombay Joint Workshop on Electrification of Transport, Mumbai, India, Aug 2024.
- **Talk** – “Effect of current density on SEI evolution in “anode-free” all-solid-state next-generation Li ion batteries” – E-MRS Fall Meeting in Warsaw, Poland; Sep 2022
- **Talk** – “Current density mediated evolution of Li metal – solid electrolyte interfaces” – Faraday Institution Conference; Nov 2021 (Online)
- **Talk** – “Interfacial Characterization, Electrochemical Evolution and Kinetics in Argyrodite Solid Electrolytes with Li Metal Anode for High Energy Density Solid-State Batteries” – 239th ECS Meeting; Jun 2021 (Online)

SPONSORED RESEARCH PROJECTS (*Last Five Years*)

	Name of Agency	Title of Project	Total Amount (INR)	Period of support	Completed/ Ongoing	Role
1.	DRDO	Design and fabrication of High Energy Density & High C-rate Rechargeable Batteries	48 Lakhs	2026-2027	Ongoing	PI
2.	DRDO (DIA-COE IIT Kanpur)	Flexible Solid-Electrolyte Alternative Chemistry Batteries (Flex SEA Bat).	891.4 Lakhs	2024-2029	Ongoing	PI
3.	Kotak School of Sustainability	A sustainable energy storage solution based on earth-abundant organic materials	86 Lakhs	2024-2026	Ongoing	PI
4.	ISRO (STC-IITK)	Development Of Earth Abundant Organic Materials As Cathode For High Energy Density Solid-State Li-Ion Batteries	28.3 Lakhs	2024-2026	Ongoing	PI
5.	SERB, DST	Practical Solid-state Lithium-Sulphur Batteries: Towards High Energy Densities Through Thin Solid-electrolyte Separators and Interface Engineering.	27.1 Lakhs	2023-2025	Completed	PI
6.	IIT Kanpur	Engineered electrode-electrolyte interfaces in Li-ion solid-state batteries for improved cyclability and mitigation of degradation	58.2 Lakhs	2022-2024	Completed	PI
7.	UKRI	LiMHiT: Lithium Metal electrode High Throughput screening. Consortium partners: Nissan Motors, Warwick Manufacturing Group, EandR Ltd., University of Oxford	596 Lakhs (£670,000)	2021-2022	Completed	Co-PI

CONSULTANCY PROJECTS (*Last Five Years*)

	Name of Agency	Title of Project	Total Amount (INR)	Period of support	Completed/ Ongoing	Role
1.	Nexera Chem Pvt. Ltd.	Lithium-ion Battery Materials Development and Performance Evaluation	7.25 Lakhs	2025-2026	Ongoing	PI

TECHNOLOGY DEVELOPMENT (*Last Five Years*)

	Entity	Technology Detail	Capital Generated (INR)	Period	Completed/ Ongoing	Role
1.	Solvo Celltech Pvt. Ltd.	Manufacture of battery active materials (anode, solid-state electrolyte, cathode, and their composites) for next-generation sodium-ion and lithium-ion batteries, developed using earth-abundant materials, offer high performance at competitive prices	22 Lakhs (Startup seed funds)	2024-Current	Ongoing	Director, CSO
2.	Aursys Dynamics Pvt. Ltd.	Research, development, testing, innovation, and consulting in the field of advanced plating and coating technologies, including but not limited to electroplating, physical and chemical vapor deposition, nano-coating, anti-corrosion treatments, and environment-friendly surface modification techniques	N/A	2025-Current	Ongoing	Director (Partner)

HONORS AND AWARDS

- 2026 P.K. Kelkar Young Faculty Research Fellow, IIT Kanpur
- 2025 Nominated representative for IIT Kanpur to participate in Conference on “Energy Storage - Driving the Clean Energy Transition” held at MNRE, New Delhi
- 2023 Invited as a panelist in the G20-Youth 20 Summit at held at IIT Kanpur, for the session “Technologies for a Sustainable Future”.
- 2022 Nominated representative of University of Oxford at Global Young Scientists Summit GYSS-2022 (Online)
- 2018 Glass R&D Director’s Award – Recognition of Exceptional Performance, Vitro Architectural Glass
- 2018 Achievement Award for R&D Innovation, Vitro Architectural Glass
- 2009 Carnegie Institute of Technology Dean’s Fellowship
- 2008 Summer Research Fellow of the Indian Academy of Sciences, Bengaluru, India

PROFESSIONAL MEMBERSHIPS, SERVICE AND ACTIVITIES

- Senate Online Program Committee (SOPC) IIT Kanpur – Chairperson, 2025-Current
- Department Online Program Committee (DOPC) convenor, Dept. of Sustainable Energy Engineering, IIT Kanpur, 2025-Current
- Department PG Committee (DPGC) member, Dept. of Sustainable Energy Engineering, IIT Kanpur – 2024-26
- Reviewer for articles submitted to Wiley, Springer, Springer Nature, and Elsevier (Scripta Materialia) journals
- Early Career Researcher Member of major scientific societies – MRS, ECS, AVS, and SVC.
- Contributing member of ŚIKṢĀ: Centre for IKS at IIT Kanpur