SILPASREE S J

DESIGNATION AND CONTACT

R&D Battery Material Scientist
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ACADEMIC QUALIFICATIONS

Doctor of Philosophy (Ph.D in Nanoscience and Technology)

2017 – 2022

Affiliation: Center for Nanosciences and Molecular Medicine, Amrita Vishwa Vidyapeetham, Kochi (India)

Thesis Title: *"A comprehensive investigation on nano-scale engineering for surface phase stabilization in $LiCoO_2$ upon extended delithiation"*
Supervisor: Dr. Dhamodaran S

Integrated MSc Physics & Mathematics

2011 – 2016

Affiliation: Amrita School of Arts and Science, Amritapuri Campus, Amrita Vishwa Vidyapeetham
Specialization: MSc Physics with Bachelors in Physics & Mathematics

Master's Thesis Title: "*Switching Mechanism of Graphene oxide*"
Supervisor: Dr. Jinesh K B

INDUSTRIAL RESEARCH EXPERIENCES

April 2024 – Present **Battery Material Scientist**
VITO R&D

- Project lead for FULL-MAP European project for Li metal passivation with atmospheric plasma deposition (Plasma glovebox setup).
- Cross collaboration with external battery research groups and industries
- Design and development of high throughput design for the plasma deposition on Li metal
- Surface modification studies on high nickel NMC and LFP for pouch cell fabrication.
- Plasma surface modification and electrolyte modification studies on cathodes for Li-S batteries
- Electrochemical performance studies on spent LFP batteries

May 2022- March 2024 **Assistant Manager-Cathode Material Research**
Battery Innovation Center
Ola Electric Mobility Technologies

- Material validation of cathodes, binders, conductive additives from various global suppliers and down selection.
- Inhouse development of Ni rich and phosphate-based cathode chemistry from lab to pilot line.
- Leads the Li and Mn rich cathode development project
- Development of solid electrolytes and interface engineering of NMC cathode with cross functional teams
- Cell fabrication, testing and validation
- Cross functional collaboration procurement and supply chain team involving discussion with external suppliers.
- Involved in setting up of lab scale research to gigafactory level.
- Fabrication of dry coating cathode electrodes.
- DOE preparation and statistical analysis with Minitab software and Taguchi Method

RESEARCH HIGHLIGHTS & PROJECTS COMPLETED

- More than 9 years of research experience in electrochemical synthesis and electrochemical testing of various energy applications.
- Hands on experience with high throughput and material scale-up projects

- Hands on experience with in-situ, ex-situ physical and electrochemical characterizations
- Cutting edge experience on surface engineering strategies for various layered, spinel and olivine cathodes for high performance lithium-ion battery applications. LCO, High Ni-NMC, LMO, LNMO, LFP, LMFP, Co free LMR cathodes etc.
- Synthesized different anode materials (including TiO_2, Ge, Ti_3C_2Tx, Cu_2Se, $Li_4Ti_5O_{12}$, Si etc.) suitable for energy storage with different morphology/architecture and studied its structure-morphology-chemistry-performance correlation in detail.
- Acquired strong background in vacuum based thin film deposition techniques like thermal evaporation, DC, RF sputtering and atmospheric plasma deposition.
- Worked on recycling and regeneration of spent lithium-ion batteries projects:
  (i) Spent graphite
  (ii) Spent $LiN_xM_yC_zO_2$-532
  (iii) Spent LFP
- Expertise in development and study of various Li and Na solid electrolytes such as $Li_xPO_yN_z$, $Li_7La_3Zr_2O_{12}$, Li_3PS_4, Na_3PS_4 and NASICON type $Na_{1+x}Zr_2Si_xP_{3-x}O_{12}$ for solid state batteries.
- Developed polymer electrolyte membranes with $Li_7La_3Zr_2O_{12}$, $Li_{1+x}Al_xGe_{2-x}(PO_4)$ and $Na_{1+x}Zr_2Si_xP_{3-x}O_{12}$ via wet mixing and studied different sets of solid-state batteries (LIB & NIB) with various cathodes.
- Years of hands-on experience on wet-chemical process like sol-gel synthesis, solvo/hydrothermal, co-precipitation and microwave process. Also familiarized with spin coating, dip coating, spray coating, electrophoretic deposition, electrospinning, vapor-phase deposition technique and mechanical milling.
- Familiarized with battery lab activities like slurry casting, cell tab welding, pouch cell stacking and sealing, coin cell and Swagelok fabrication. Well capable of handling the glovebox, cell testing protocols (Biologic, MTI and Arbin battery workstations) and data analysis.
- Deep operational knowledge in sample preparation, measuring and analyzing the XRD data in Bruker D2 Phaser instrument. Well expertise in analyzing the material characterization tools such as SEM, TEM, Raman, PSD, BET, TGA, XPS and UV-Visible spectroscopy.
- Practical experience with XRD Rietveld Refinement using FullProf Suite software.

- Trained 10+ graduate students in material synthesis, device fabrication, electrochemical testing and analyzing the results for their project works.

PUBLICATIONS

1. Anjali V Nair., **Jayasree, S.S.,** Nair, S. and Santhanagopalan, D. Environment-friendly acids for leaching transition metals from spent-NMC532 cathode and sustainable conversion to potential anodes. ***RSC Sustain.***, 2024, **2**, 2377-2388
2. **Jayasree, S.S.,** Gangaja, B., Dona S. Baji, Anjali V Nair, Nair, S. and Santhanagopalan, D., 2023. Energy efficient regeneration of spent graphite anode for high rate and ultra-long cycle life sodium ion batteries. ***Resources, conservation and Recycling***, 190, 106841.
3. **Jayasree, S.S.,** Nair, S. and Santhanagopalan, D., 2022. Nanoscale-Engineered $LiCoO_2$ as a High Energy Cathode for Wide Temperature Lithium-ion Battery Applications- Role of Coating Chemistry and Thickness. ***Nanotechnology,*** 33, 275403.
4. Pooja B, Dona S.Baji, **Jayasree, S.S.** and Santhanagopalan, D., Challenges and Prospects. **Green Chemistry in Electrochemical Energy Storage Technologies. Book Chapter (Accepted).**
5. **Jayasree, S.S.,** Nair, S. and Santhanagopalan, D., 2022. Particle size dependent electrochemical performance of cobalt-free, lithium and manganese rich layered cathode at elevated temperatures. ***MRS Communications,*** *12, 1183-1189.*
6. **Jayasree, S.S.,** Murali A.S., Nair, S. and Santhanagopalan, D.,2022. Recent Progress on Low and High Temperature Performance of Nanoscale Engineered Li-ion Battery Cathode Materials. ***Nanotechnology*****,** 33, 352001**.**
7. **Jayasree, S.S**., Nair, S. and Santhanagopalan, D., 2020. Surface Chemical Analysis of Solid-Electrolyte Interphase Layer on Germanium Thin Films and the Effect of Vinylene Carbonate Electrolyte Additive. ***Lithium-ion Batteries- Thin Film for Energy Materials and Devices***, p.107. **(Book Chapter).**
8. Gangaja, B., **Jayasree, S.S**., Nair, S. and Santhanagopalan, D., 2018. Effect of Lithiation Voltage Limit on the Electrochemical Performance of High Surface Area Anatase TiO_2 Nanoparticles and Its Application in Full-Cell Li–Ion Battery. ***ChemistrySelect****, 3*(43), pp.12258-12262.

9. **Jayasree, S.S.**, Nair, S. and Santhanagopalan, D., 2018. Ultrathin TiO_2 coating on $LiCoO_2$ for improved electrochemical performance as Li–ion battery cathode. ***ChemistrySelect,*** *3*(10), pp.2763-2766.

PATENTS

1. Surface Coating for Positive electrode in secondary Batteries and Preparation Methods Thereof- 2022
2. Surface Engineered Positive Electrode Material in secondary Batteries and Preparation Methods Thereof- 2022
3. Surface coating for single crystal nano porous positive electrode in secondary batteries and preparation methods thereof- 2022
4. An Electrode Composite and Processes Thereof- 2023

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