GANESH RAGHAVENDRAN, Ph.D.

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PhD-trained chemical engineer with over five years of experience applying advanced process modeling and data analysis to optimize complex systems. Demonstrates strong problem-solving skills and a willingness to execute multiple tasks, with a proven ability to leverage simulation tools and programming to enhance performance and troubleshoot failures. Possesses a track record of developing digital solutions that improve operational efficiency through effective teamwork. Offers deep expertise in battery cell design principles, statistical analysis, and cross-functional collaboration to drive innovation in all-solid-state battery development, consistently contributing to team success and project achievements.

SKILLS

Programming /Software skills: C, C++, C# MATLAB, Aspen-HYSYS, Origin, AutoCAD, SolidWorks, Python, EC-Lab, ZView, VB.Net, LabView, LAMMPS – MD Simulation, Linux/UNIX systems, DFT Calculations – VASP, Gaussian16.

Experimental Techniques & Equipment:

Electrode Slurry Optimization/Casting, Pouch Cell making, Gas Filling station (with Mass Flow Contoller and LabView), Battery Testing Station (Neware, Arbin, Landt, Biologic), Scanning Electron Microscopy (SEM), Thermogravimetric Analysis-Differential Scanning Calorimetry (TGA-DSC), Gas Chromatography (GC), X-Ray Diffraction (XRD), Raman Spectroscopy, Cyclic Voltammetry (CV), Electrochemical Impedance Spectroscopy (EIS), Linear Sweep Voltammetry (LSV), Galvanostatic Intermittent Titration Technique (GITT), X-Ray Photoelectron Spectroscopy (XPS), Transmission Electron Microscopy (TEM) analysis.

EDUCATION

Doctor of Philosophy, Chemical Engineering **Apr 2021 – Jun 2025**

(PI: Prof. Ying Shirley Meng, Co-PI: Prof. Tod Pascal)

University of California - San Diego | GPA: 3.70/4.00

Master of Science, Chemical Engineering **Sep 2019 – Mar 2021**

University of California - San Diego | GPA: 3.70/4.00

Bachelor of Technology, Chemical Engineering **Jul 2013 – Jul 2017**

National Institute of Technology | GPA: 8.70/10.00

PROFESSIONAL EXPERIENCE

Senior Process Engineer, Gas Authority of India Ltd. **Apr 2017 – Jul 2019**

- Managed and operated a 900KTA capacity Gas Cracking Unit (GCU I) as a Field Engineer, ensuring continuous operation and safety protocols.
- Developed process simulation models utilizing Aspen-HYSYS and MATLAB, modeling the Gas Sweetening Unit with unknown proprietary additive.
- Trained in Yokogawa and Emerson Distributed Control Systems for real-time process monitoring and control.
  Demonstrated strong communication skills by creating and implementing 'Saransh,' a web-based P&ID portal that digitalized plant diagrams through employee crowd-sourcing.

Chemical Engineering Intern, Reliance Industries Ltd. **May 2016 – Aug 2016**

- Analyzed Ammonium Bisulphide corrosion in Amine Treatment Unit (ATU) Overhead Circuit
- Utilized ASPEN HYSYS and PetroSim simulation tools to model and optimize process parameters -Proposed four viable solutions with varying feasibility assessments to mitigate corrosion issues

Software Engineering Intern, Monitpro Solutions Pvt. Ltd. **May 2015 – Oct 2016**

- Facilitated setting up Real-Time data integration systems for medium-scale chemical industries.
- Designed web applications featuring Treemap view of equipment and Key Performance Indicators (KPIs).
- Developed solutions using VB.Net and C# to improve data visualization and equipment monitoring, using historian data.
- Successfully coordinated with project managers to address over 20 customer requests, ensuring timely and effective responses.

RESEARCH EXPERIENCE

Enabling liquefied gas electrolytes for sodium metal batteries (PI: Prof. Shirley Meng)

- Developed a needle-valve based electrochemical cell setup that ensured homogeneous pressure distribution for high-pressure electrolyte applications.
- Developed a comprehensive calibration protocol for mass flow controllers, establishing gas correction factors (GCF) that facilitated systematic screening of novel solvents.
- Formulated a novel electrolyte composition enabling extreme temperature operation of sodium metal batteries, demonstrating functionality at -60°C while supporting ultra-fast 40C charge/discharge rates (complete cycling in 90 seconds).
- Characterized electrolyte components using Raman spectroscopy, molecular dynamics simulations, and XPS

Weakly coordinating anion – Weakly coordinating solvent : Class of electrolytes for high rate batteries
(PI: Prof. Shirley Meng, Prof. Tod Pascal)

- Pioneered a breakthrough electrolyte system achieving unprecedented conductivity metrics: 40 mS/cm at room temperature and 24 mS/cm at -60°C – establishing a new performance benchmark for low-temperature applications – Patent Filed.
- Characterized the electrolyte and compared with baseline electrolytes with NMR, MD Simulations, Raman spectroscopy.
- Developed a predictive screening framework based on Gibbs free energy of mixing calculations, enabling systematic identification of promising electrolyte compositions.

Recoverable Aggregate-Rich Liquified Gas Electrolytes for Enabling High-Voltage Lithium Metal Batteries
(PI: Prof. Shirley Meng)

- Formulated a novel ionic liquid-based liquefied gas electrolyte with a conductivity of 17.7 mS/cm at room temperature, enhancing the efficiency of lithium rechargeable batteries.
- Engineered an innovative separation protocol exploiting differential phase behavior to isolate and recover both liquefied gas and ionic liquid components from spent electrolytes.
- Developed a sustainable extraction methodology incorporating water-based leaching techniques that achieved >99% purity of recovered ionic liquids, verified through FTIR spectroscopy.
- Characterized electrolyte components using Raman spectroscopy, molecular dynamics simulations, and XPS.

Deep learning assisted high-resolution microscopy image processing for phase segmentation in functional composite materials
(PI: Prof. Shirley Meng)

- Implemented a Python-based GUI tool for high throughput TEM image processing and component mapping
- Reduced time requirements for analyzing large TEM datasets (>100 images) while minimizing human error
- Applied methodology to study beam damage of LiF particles in battery materials at cryogenic temperatures

PATENTS AND SELECTED PUBLICATIONS *(Google Scholar: http://bit.ly/4iaRlFW, Citations:386, h-index:7)*

1. **[PATENT] Raghavendran, G.,** Meng, Y.S.M., Yin, Y., Yang, Y., Mayer, M., Li, W., *Recycling and recovery of used liquefied gas electrolyte and battery salt, and compositions of fire-extinguishing electrolytes for batteries*, International Publication Number : WO 2023/168462, 07 September 2023
2. **[PATENT] Raghavendran, G.,** Meng, Y.S.M., Pascal, T.A., Figueroa, J.S., Yang, E.S., *Weakly coordinating salt – Weakly coordinating solvent: A new class of battery electrolyte*, Invention Disclosure Accepted, Patent Filed.
3. **Raghavendran, G.**, Liu A., Borodin, O., Hahn, N., Leung, K., Park, NR., Nivarty, T., Li, M., Larson, A., Yin, Y., Zhang, M., Meng, Y.S.M. Recoverable Aggregate-Rich Liquefied Gas Electrolytes for Enabling High-Voltage Lithium Metal Batteries. *ChemRxiv. 2025*; doi:10.26434/chemrxiv-2025-9mrf (Under Review)
4. **Raghavendran, G.**, Han, B., Adekogbe, F., Bai, S., Lu, B., Wu, W., Zhang, M., Meng, Y.S., 2024. Deep learning assisted high resolution microscopy image processing for phase segmentation in functional composite materials. *Journal of Microscopy, 2025*.
5. Sayahpour, B., Li, W., Bai, S., Lu, B., Han, B., Chen, Y-T., Deysher, G., Parab, S., Ridley, P., **Raghavendran, G.**, et al., 2024. Quantitative analysis of sodium metal deposition and interphase in Na metal batteries. *Energy & Environmental Science*, *17*(3), pp.1216-1228.
6. Bao, W., Yao, W., Li, Y., Sayahpour, B., Han, B., **Raghavendran, G.**, Shimizu, R., Cronk, A., Zhang, M., Li, W., et al., 2024. Insights into lithium inventory quantification of LiNi 0.5 Mn 1.5 O 4–graphite full cells. *Energy & Environmental Science*, *17*(12), pp.4263-4272.
7. Yao, W., Chouchane, M., Li, W., Bai, S., Liu, Z., Li, L., Chen, A.X., Sayahpour, B., Shimizu, R., **Raghavendran, G.**, et al., 2023. A 5 V-class cobalt-free battery cathode with high loading enabled by dry coating. *Energy & Environmental Science*, *16*(4), pp.1620-1630.
8. Yin, Y., Holoubek, J., Liu, A., Sayahpour, B., **Raghavendran, G.**, Cai, G., Han, B., Mayer, M., Schorr, N.B., Lambert, T.N., et al., 2023. Ultralow-Temperature Li/CFx Batteries Enabled by Fast-Transport and Anion-Pairing Liquefied Gas Electrolytes. *Advanced Materials*, *35*(3), pp.2207932.
9. Cheng, D., Lu, B., **Raghavendran, G.**, Zhang, M., Meng, Y.S., 2022. Leveraging cryogenic electron microscopy for advancing battery design. *Matter*, *5*(1), pp.26-42.
10. Yin, Y., Yang, Y., Cheng, D., Mayer, M., Holoubek, J., Li, W., **Raghavendran, G.**, Liu, A., Lu, B., Davies, D.M., et al., 2022. Fire-extinguishing, recyclable liquefied gas electrolytes for temperature-resilient lithium-metal batteries. *Nature Energy*, *7*(6), pp.548-559.

CONFERENCE/POSTER PRESENTATIONS

- "*Recoverable Aggregate-Rich Liquified Gas Electrolytes for Enabling High-Voltage Lithium Metal Batteries*" **SPEC Summit Poster Presentation**, San Diego, California- 17th September 2024.
- "*Deep learning assisted high-resolution microscopy image processing for phase segmentation in functional composite materials*" **245th ECS Meeting**, San Francisco, California- 26th May-30th May 2024.