

# Fast-Charging, Wide-Temperature, Low-Cost, Durable Batteries Enabled by Cobalt- and Nickel-Free Cathodes and Cell Engineering

**Feng Lin, Virginia Tech**

**Team Members:** Zhengrui “Ray” Xu (Fermi Energy, Inc.), Paul Albertus (Univ. Maryland), Wu Xu (PNNL), Xilin Chen (Saft America), Lei Tao (Virginia Tech)



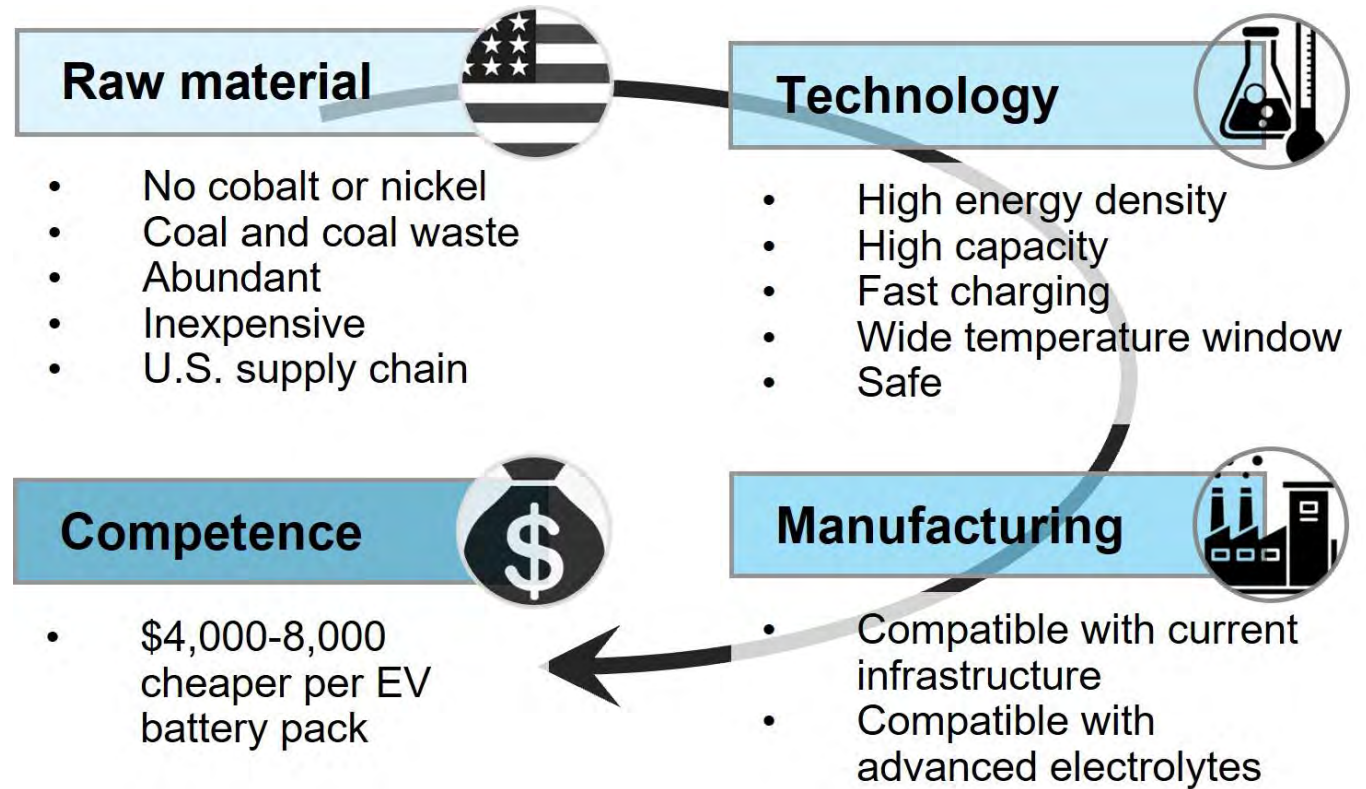
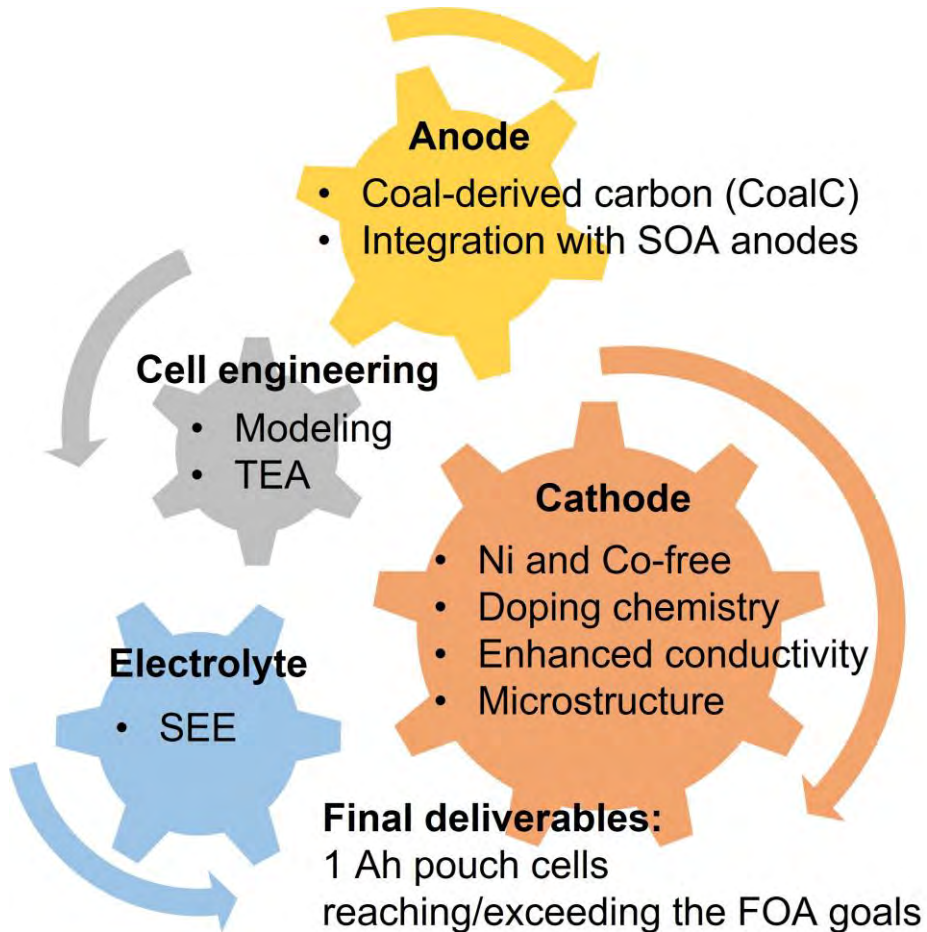
**EVs4ALL Program  
Annual Meeting  
June 17-18, 2025**

## Project Vision

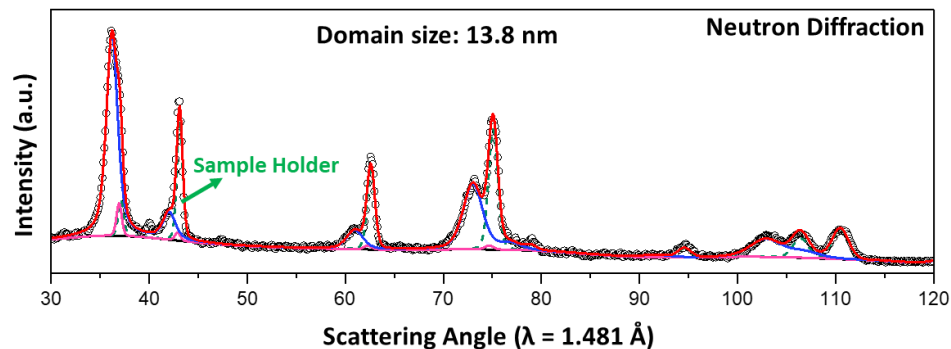
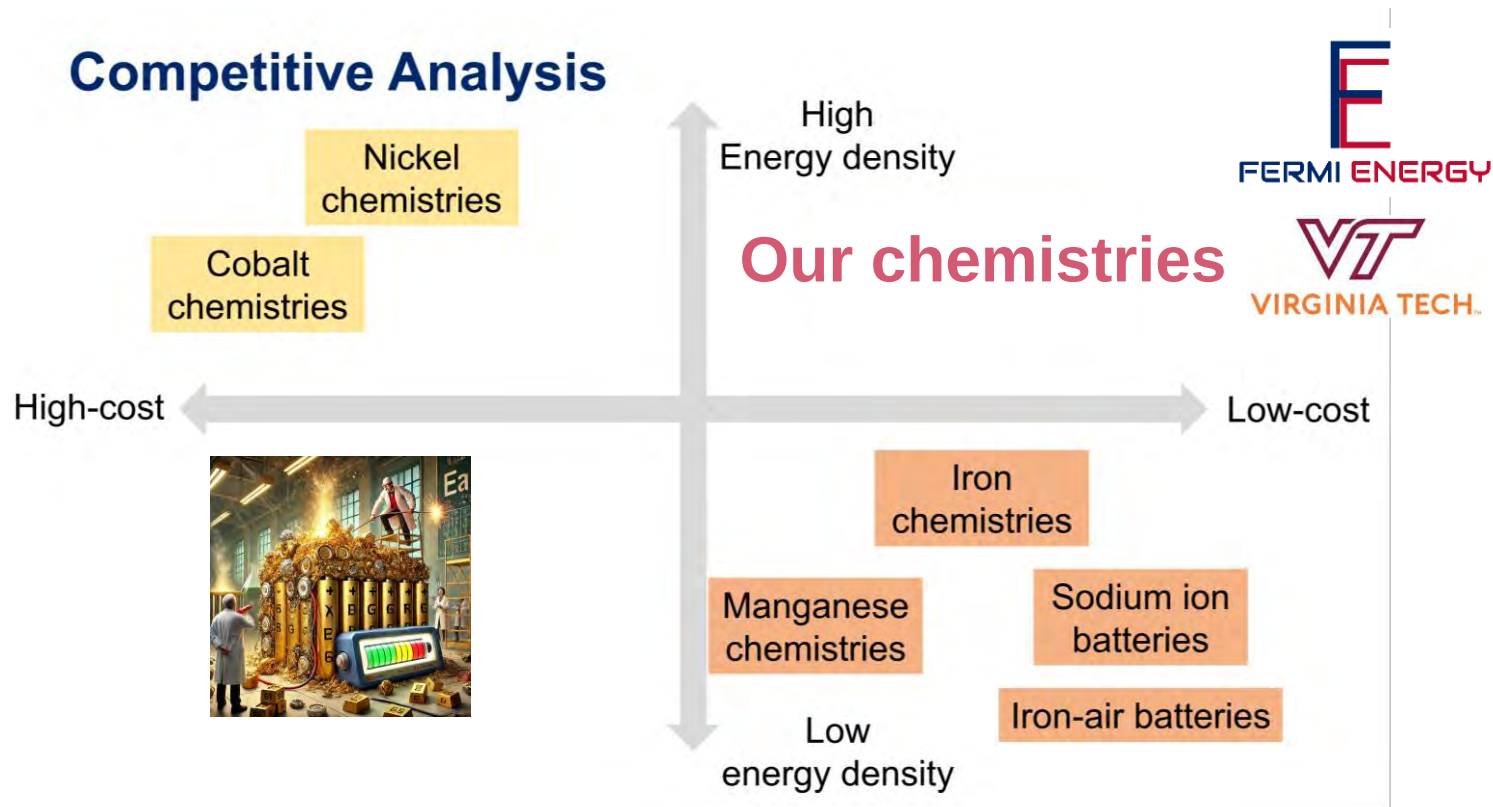
Virginia Tech will develop fundamentally disruptive electric vehicle batteries using cobalt- and nickel-free cathodes, fast-charging and all-weather electrolytes, and coal-derived fast-charging and high-capacity anodes.



# Technology Concept

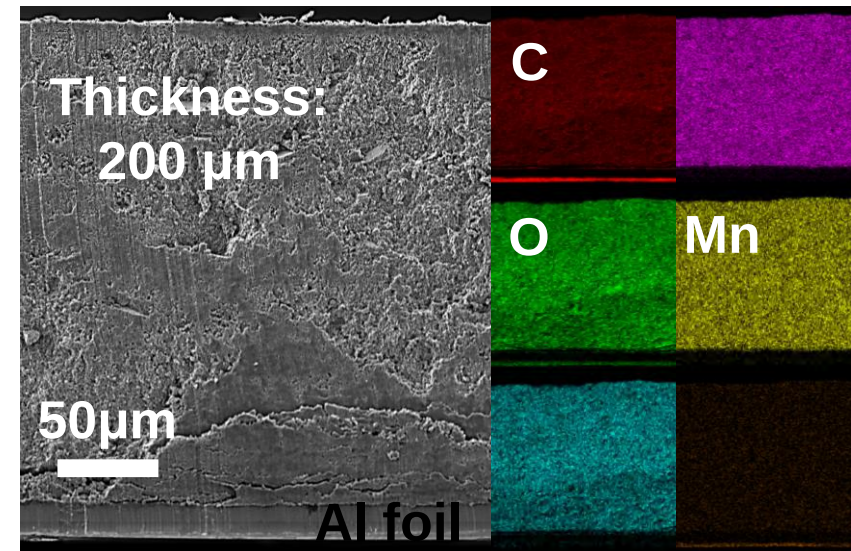


# Technology Concept



Composite cathode

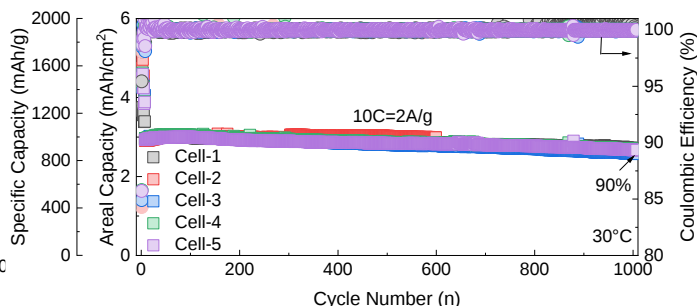
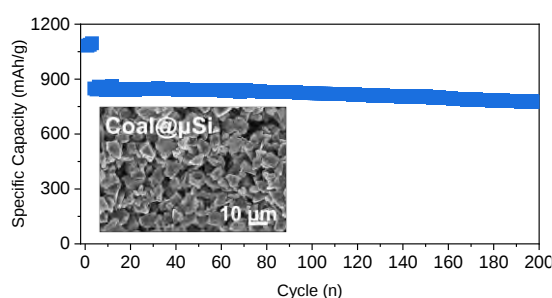
## Co/Ni-Free cathode



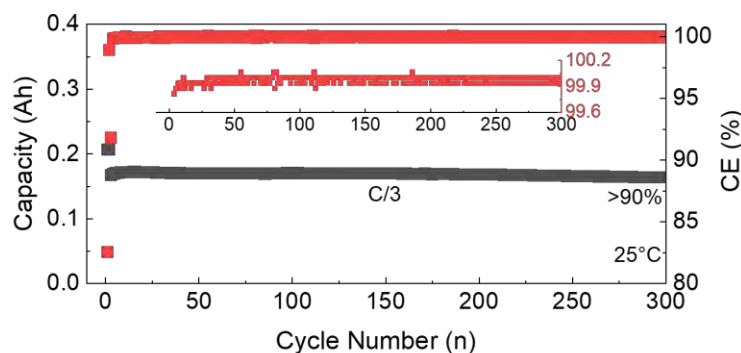
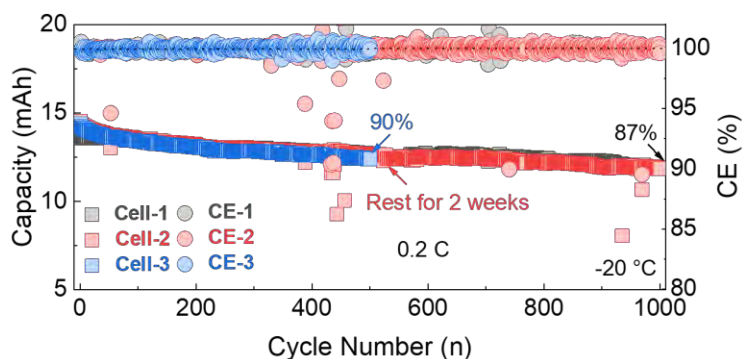
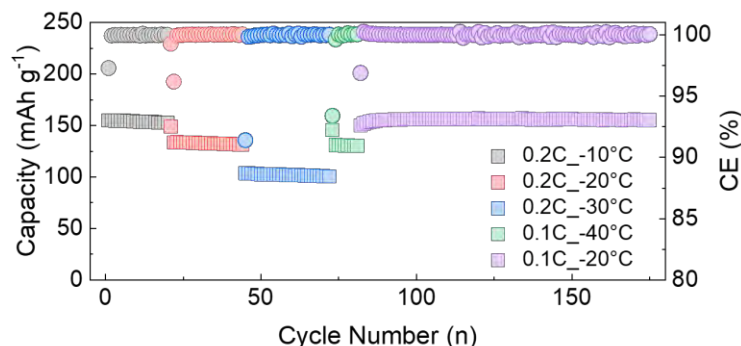
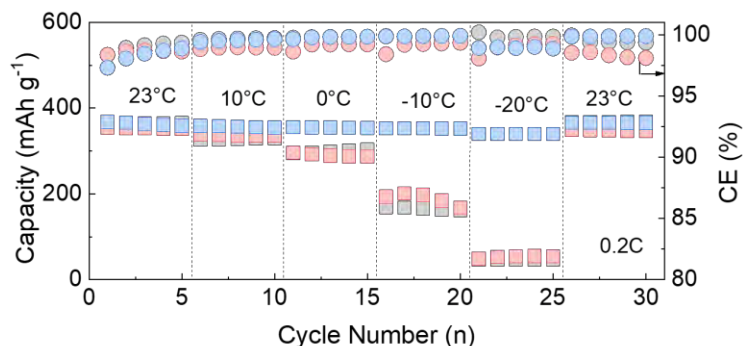
- Smooth surface, no cracks;
- Easy to handle high-loading electrodes ( $>7\text{mAh/cm}^2$ );
- Low porosity reduces the side reaction;
- Dense, high-energy density;
- Good flexibility and stability.

# Major Technical Highlights

## Competitive Anode Advantages



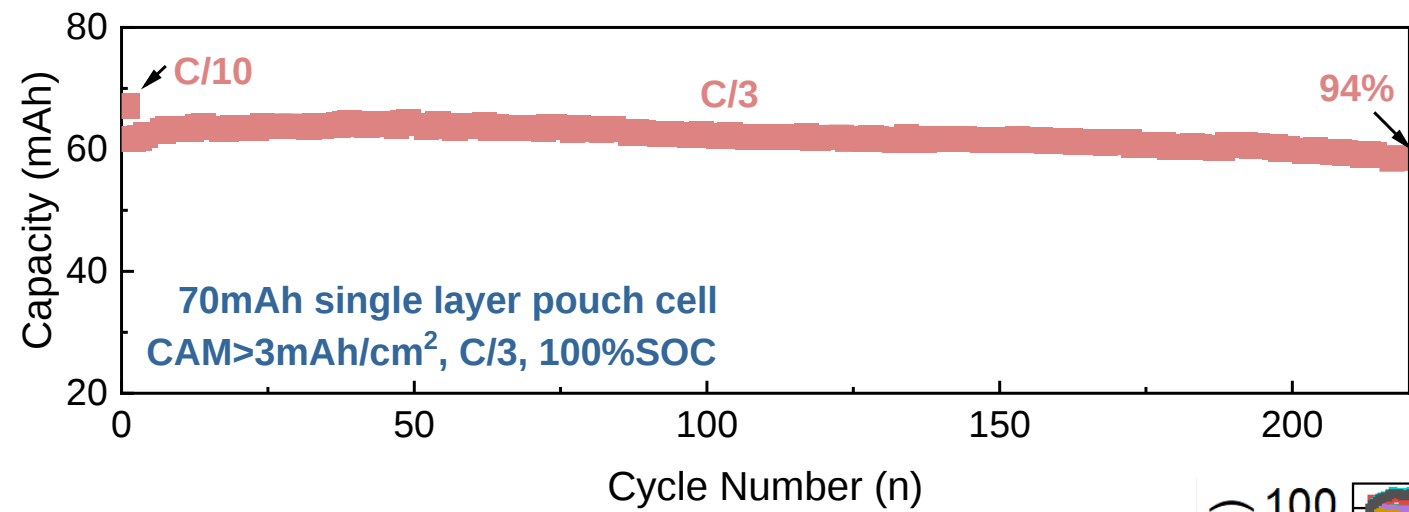
## SEE Electrolyte Advantages



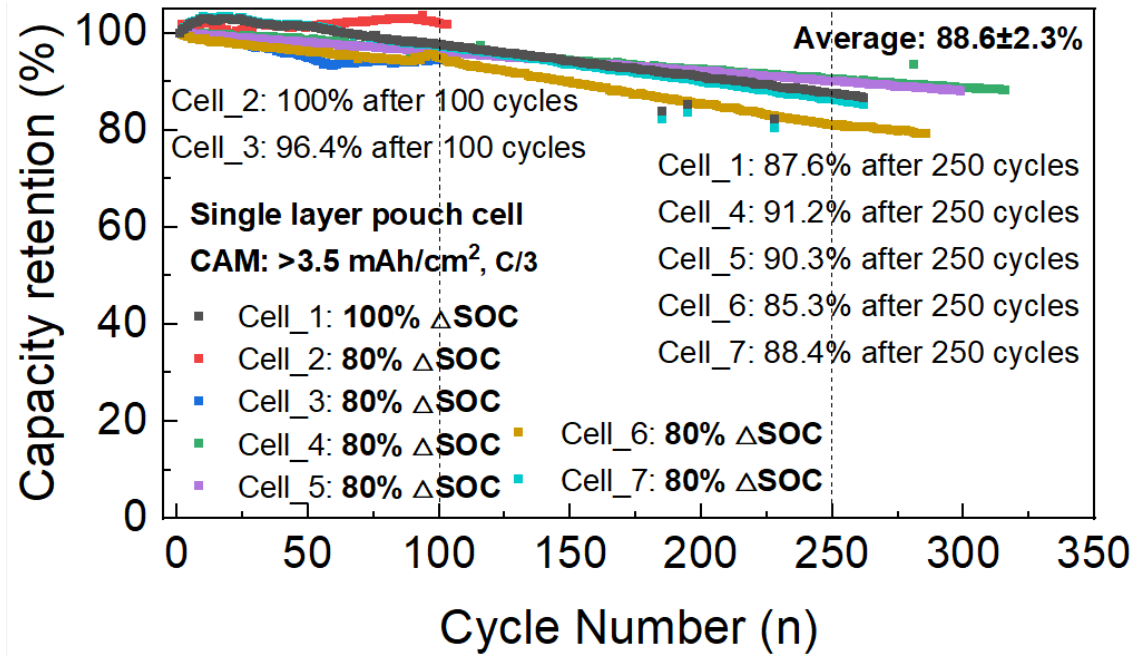
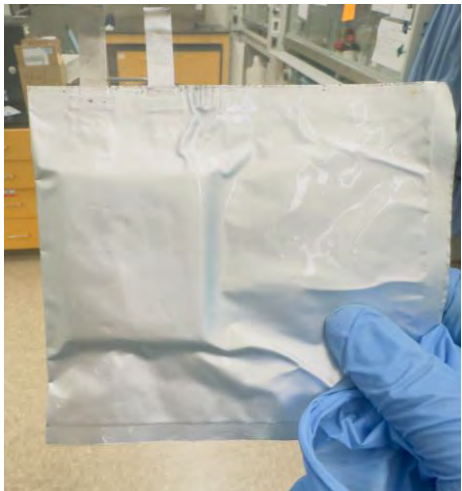
- Low cost and easy to handle, with high yield
- High capacity and moderate voltage
- Excellent stability and fast charging capability

- In situ polymerization
- Favorable SEI composition and microstructure
- Low energy barriers, fast  $\text{Li}^+$  transport
- Good e-chem stability
- Wide temperature

# Major Technical Highlights



➤ **1Ah Pouch cell (testing ongoing)**



# Team and Potential Partnerships

## Team members



Feng Lin



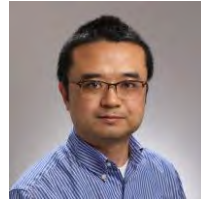
Lei Tao



Paul Albertus



Wu Xu



Xilin Chen



Ray Xu

Afolabi Olayiwola

Michael McKee

Minyung Song

Charlie Ver Beek

Junyi Yao

Zhaohui Liang

David Kautz



**External partners:** 10 potential customers for product validations and 1 paid pilot-scale demo for this technology.

## The team is looking for:

- Experts for large cell integration and manufacturing
- Domestic Si-based anode partners



# Thank you

**Feng Lin, Virginia Tech**

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