Overcoming Interfacial Impedance in Solid-State Batteries

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

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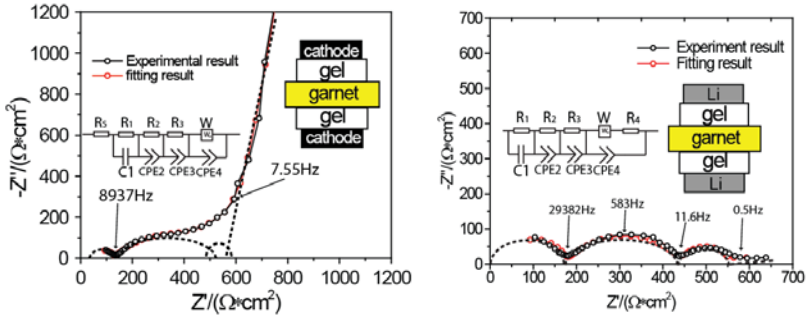
Technical Approach:

- Investigate fundamentals of solid-solid interfacial impedance through integrated experimental and computational techniques
- Develop stable interfacial layers to overcome interfacial impedance

Status:

- Characterized solid electrolyte, cathode, and their interfacial impedances
- Developed Gel compositions to achieve 250 Ω*cm^2 garnet-electrode interfacial impedance

Technology:



EIS of garnet/gel/electrode half cells demonstrating interfacial impedance of ~250 Ω*cm^2

Objectives:

- Develop a multifaceted and integrated (experimental and computational) approach to reduce interfacial impedance of garnet-based solid-state Li ion batteries.

Deliverables: Develop interface layer that reduces interfacial garnet/electrode interfacial impedance to about 10 Ω*cm^2

Funding:

— Duration - 3 yrs
— Total - $1,212K
— DOE - $1,212K

Milestones:

- Q1 Milestone: Identify compositions of PFPE or Gel electrolyte to achieve 100 Ω*cm^2
- Q2 Milestone: Determination of interfacial impedance in layered and 3D controlled solid state structures
- Q3 Milestone: Develop computation models to investigate interfacial ion transport with interlayers
- Q4 Milestone: Identify compositions out of 4 types of interlayers and processing with interfacial impedance ~10 Ω*cm^2 between electrolyte and electrode.