

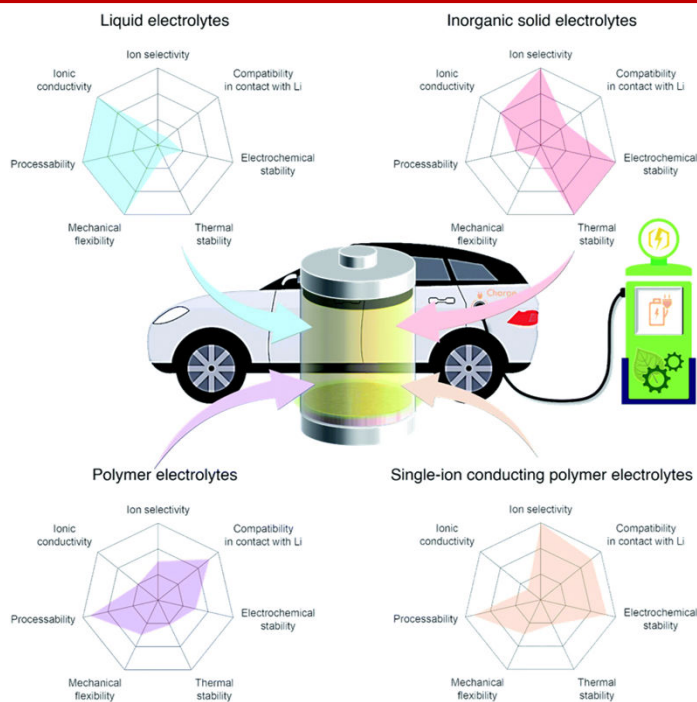


Single-ion Conducting Polymer Electrolytes for Lithium Metal Batteries

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Department of Mechanical Engineering

Solid State Electrolytes for Lithium Batteries

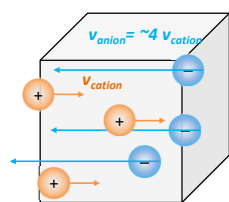


Chem. Sci. 12 (2021) 13248

Single-Ion Conductors (SICs) are Desirable

Current polymer electrolytes

Dual-ion conductor

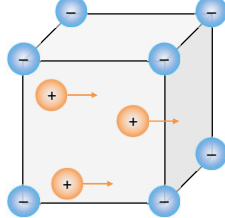


Mobile anions

- Low ionic selectivity ($t_{Li^+} \approx 0.2$)
- Concentration polarization and limited cycle life
- Low oxidation voltage (< 4 V)

Ionomer electrolytes

Single-ion conductor



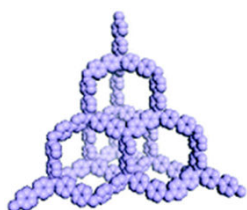
Immobile anions

- High ionic selectivity ($t_{Li^+} \approx 1$)
- Much longer cycle life
- High oxidation voltage (> 4 V)
- Minimization of dendrite growth

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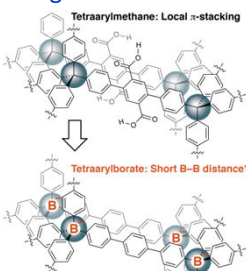
The Shin Group Strategy

Porous Aromatic Frameworks (PAFs)



- Light elements: B, N, C, H
- Covalent bonds
- Crystalline or amorphous
- Porous

Single-ion conductor



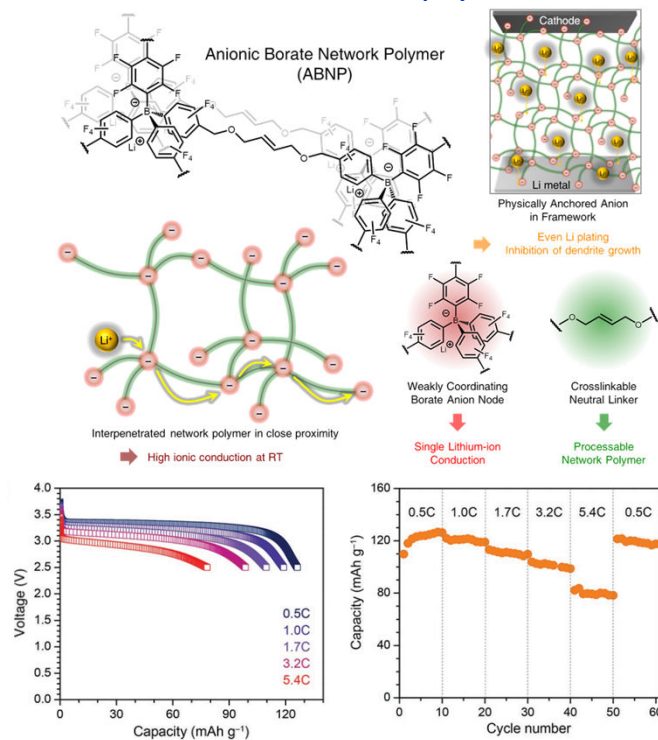
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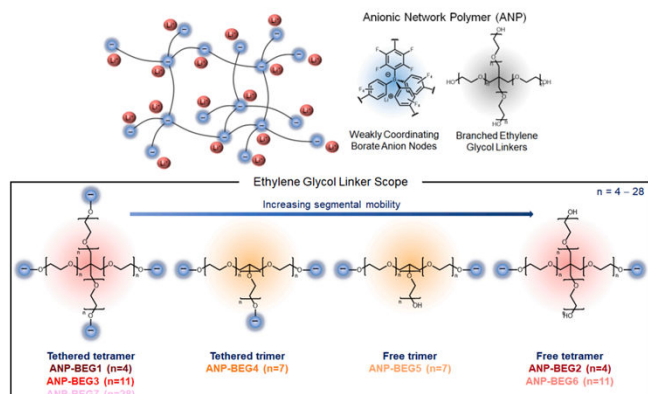
J. Axelson, Ph.D. Dissertation, UC Berkeley, 2016.

The Shin Group Research Highlight

Processable SIC network polymers!



Segmental mobility dynamics in SIC network polymers!



Chem. Eng. J. 450 (2022) 138407

Click-reacted SIC network polymers!

