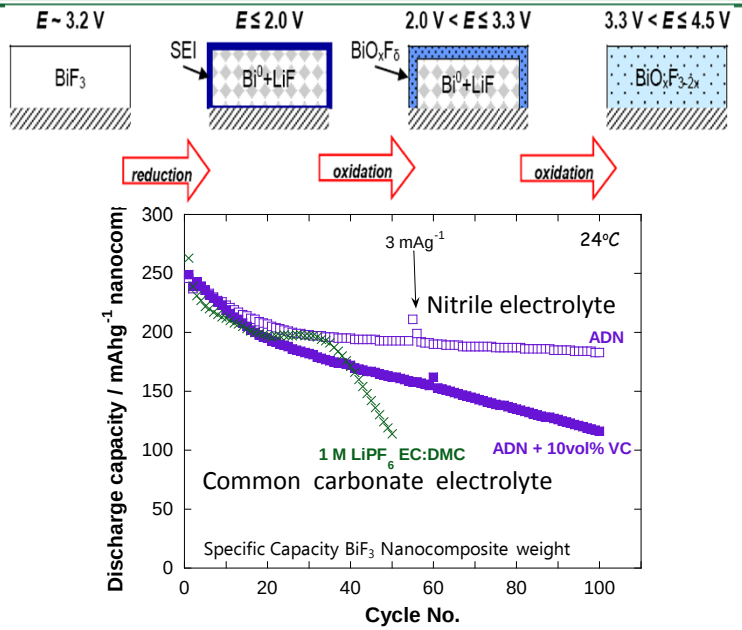
Cannibalization of Electrolyte Decomposition Products

Scientific Achievement

The dynamic interaction of metal fluoride conversion materials and electrolyte was identified, the mechanism of interaction established, and electrolytes demonstrating significantly improved cycling performance were developed.

Significance and Impact

Metal fluoride conversion positive electrodes represent a pathway to high energy density batteries in the future. To date, the root cause cycling reversibility challenges has been attributed to sluggish transport, electromechanical grinding, and morphology change. We show for the first time that the electrolyte actively interacts with the subsurface of conversion fluorides and that proper development of electrolytes can lead to significantly improved electrochemical performance.



Schematic showing electrolyte decomposition process affecting subsurface chemistry of bif_3 conversion electrode and improvement via by improved electrolyte

Research Details

- Cyclic carbonate electrolytes proven to interact with converted nano Bi metal at voltages up to 2V
- As formed lithium and alkyl carbonates subsequently anodically decompose leading to formation of subsurface oxides by diffusion of oxygen species, a reaction unique to conversion materials
- Stable non-carbonate nitrile electrolytes developed to improve cycling stability by >3X

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