

Interactions of cation disordered rocksalt cathodes with various electrolytes

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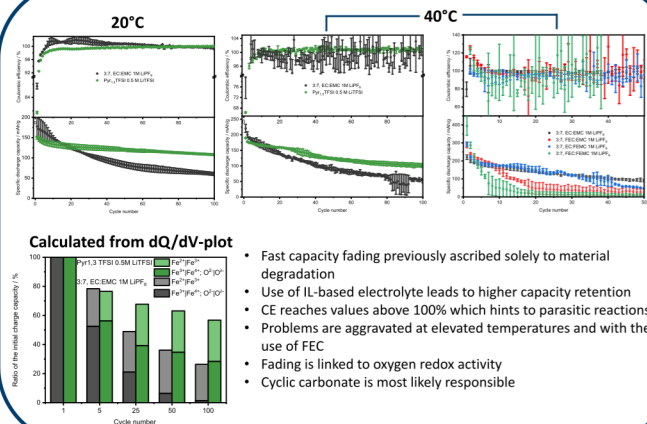
Introduction

The ongoing development of cathode materials is a key strategy for further increasing the energy density of LIBs.[1] Cation disordered rocksalt cathode materials have gathered increased research interest over the last couple of years due to their high specific capacity and wide array of available element combinations.[2] Up to now, it is still unclear whether the capacity fading observed for this type of material is solely due to the occurrence of not fully reversible anionic redox reactions and consequent material degradation, or also contributed by the side reactions between the cathode material and carbonate-based electrolytes.[3] In order to address it, this study compares the differences in electrochemical performance of a rocksalt $\text{Li}_{1.25}\text{Fe}_{0.5}\text{Nb}_{0.25}\text{O}_2$ cathode, that was shown to involve oxygen redox reaction via a reductive coupling mechanism,[4] and cathode electrolyte interphase (CEI) formation in both lithium metal and lithium ion cells between using a conventional carbonate-based electrolyte and an ionic liquid-based electrolyte.[5]

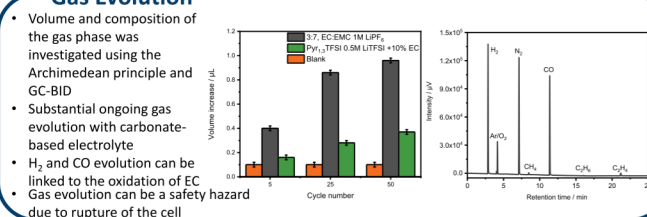
Experimental

Carbon coated $\text{Li}_{1.25}\text{Fe}_{0.5}\text{Nb}_{0.25}\text{O}_2$ as cathode active material
Active material/PVdF/Supercap C65 80 : 10 : 10
3-Electrode Swagelok cell (2032 Coin cells and pouch cells for Li-ion set-up)
Electrolyte 150 μL (50 μL for coin cells; 350 μL for pouch cells) 1 M LiPF₆ in 3:7 EC:EMC or 0.5 M LiTFSI in Pyr_{1.3}TFSI
Separator Whatman GF/D (1 layer Freudenberg 2226)
Cell voltage window 1.5 – 4.6 V (0.5 – 4.6 V)
C-Rate 1C = 300 mA g⁻¹

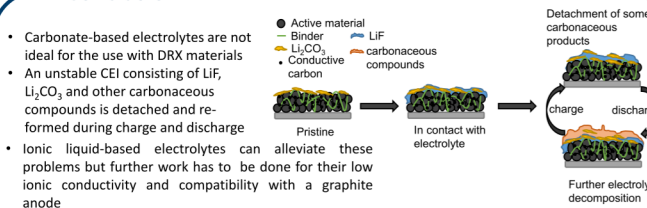
Electrochemical performance



Gas Evolution



Conclusion



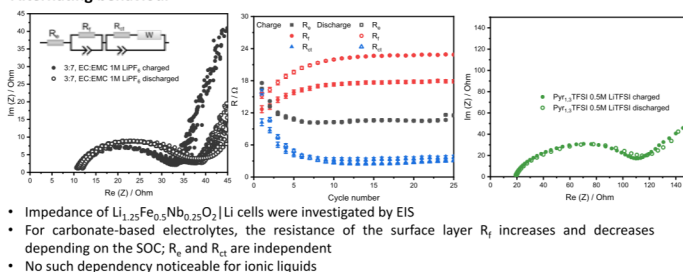
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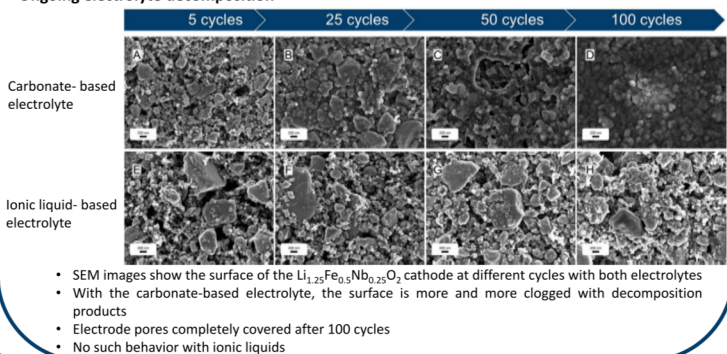
CEI Investigation



Alternating behaviour



Ongoing electrolyte decomposition



Acknowledgment

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