

Effect of Anion Receptor on Li-ion Battery Performance in $LiPF_6$ and LiF Containing Electrolytes

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In response to the need for high energy density batteries, dual carbon cells using $LiPF_6$ or LiF salts are considered promising systems. In such cells, carbonaceous materials serve as both anode and cathode active materials that intercalate Li^+ and PF_6^- (or F^-) ions respectively. The major shortcoming associated with the use of LiF as the salt is its limited solubility in organic electrolytes (1). Anion complexing agents (i.e. Trishexafluoroisopropylborate, THFIPB) are employed as a modifying additive to promote LiF dissolution (2), and its compatibility with anode and cathode chemistries should be addressed.

This work relates to the effect of THFIPB on both PF_6^- and F^- intercalation in various types of graphite as well as graphene when the cells are cycled between 3.0V and 5.0V. In addition, test cells were cycled between 3.0V and 0.005V to reveal the performance of $LiPF_6$ and LiF salts on the anode carbon in the presence of THFIPB. Electrolytes of various mixing ratios of $LiPF_6$ and LiF in PC:DMC and EC:DEC were used. It was shown that in the absence of THFIPB, graphitic cathode suffered exfoliation as evident from the post-mortem SEM analysis (Figure 1) and the noisy (dis)charge curves (Figure 2), while the addition of THFIPB prevented the exfoliation.

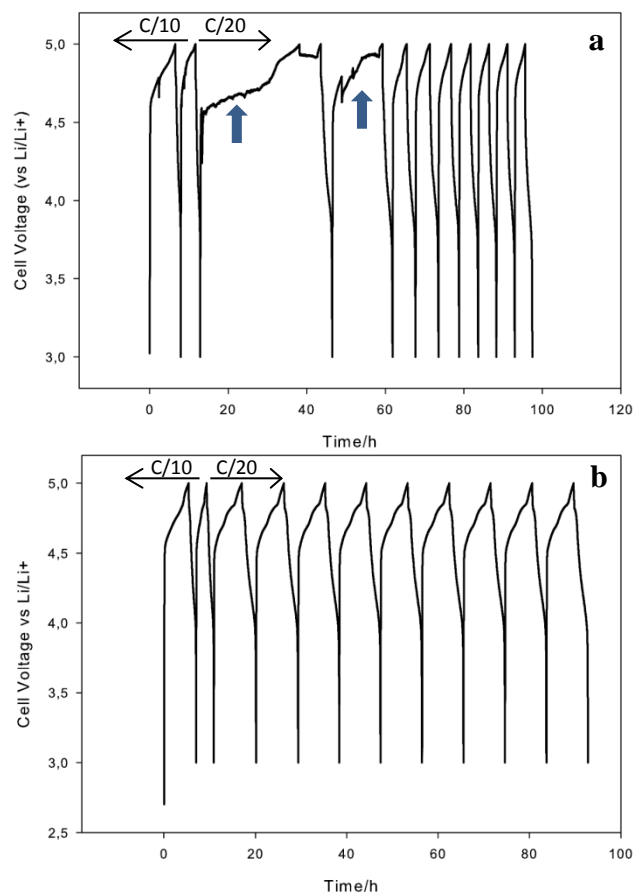


Figure 2. (Dis)charge profiles of the half cells cycled a) without THFIPB, b) with THFIPB

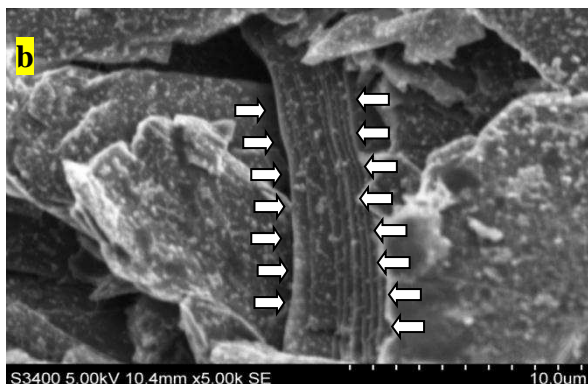
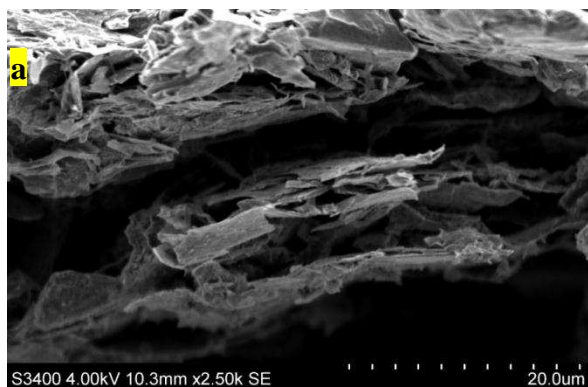


Figure 1. Post-Mortem SEM images of cathodes cycled in a) non-THFIPB, b) THFIPB containing electrolyte

References

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