

Effect of VC in Graphite / NMC cells: Coulombic Efficiency and Rate Performance

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Abstract:

Degradation at the electrode surface is one of the major reasons behind the capacity fade in a well-made battery. The addition of electrolyte additives is known to alter the surface and rate of intercalation and side-reactions. In particular, VC has been studied extensively for different lithium ion chemistries and is shown to improve columbic efficiency of different electrodes. In this study, the effect of vinylene carbonate (VC) as an electrolyte additive in a graphite/NMC 333 (lithium-nickel-manganese-cobalt oxide) cell was investigated. A three- electrode cell configuration was used to understand the performance of individual electrodes at different discharge rates in the presence of VC and compare it with neat electrolyte. Such a study shows that the addition of VC improves the rate performance especially at moderately high rates. It was also observed that the rate of side reactions was decreased with the addition of VC. Despite these important performance improvements, it was interesting to find that there was no significant improvement in the cycling performance even though there was significant improvement in columbic efficiency. This suggests that coulombic efficiency may not always be a perfect indicator of the expected lifetime of a cell.