# Electrolyte Additives Improved High Rate Performance at High Voltage System for $LiCoO_2$/Graphite Pouch Cells

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## Abstract

1,2-Ethylene sulfate ($C_2H_4O_4S$, DTD) was one of the effective electrolyte additive to improve the performances of high rate at above 4.4V working potential. DTD consists sulfur-containing specie of low LUMO binding energy (0.04eV), could form protective solid electrolyte interphases on both cathode and anode surfaces. The interphases that indicated effectively reduce impedance and increase capacity retention after cycling compared to cells without additives. The 0.5~1% DTD additive show improved high-rate capability, with a 500 cycle-life under 3C charge/5C discharge conditions of 10% higher than unmodified sample. Besides, under 8 ℃ low temperature cycle test has over 97% capacity retention with a 100 cycles at 1C rate. The presence of DTD in the electrolyte endures a higher charging potential of 4.4 V for $LiCoO_2$/graphite pouch cells, which significantly improves cycling stability and that has already been widely used for commercial lithium ion batteries.

*Keywords – DTD, Solid Electrolyte interphases, impedance, 3C Charge/5C Discharge Conditions, $LiCoO_2$/graphite pouch cells*

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