

Supporting Information:

Insight into the Mechanism of Improvement Interfacial Properties Between Electrodes and Electrolyte in Graphite/LiNi_{0.6}Mn_{0.2}Co_{0.2}O₂ Cell Via Incorporation of 4-propyl-[1,3,2] Dioxathiolane-2,2-dioxide (PDTD)

Yilong Lin,[†] Mengqing Xu,^{*,†,‡} Suping Wu,[†] Yuanyuan Tian,[†] Zhiguang Cao,[†] Lidan Xing,^{†,‡} and
Weishan Li^{*,†,‡}

[†] School of Chemistry and Environment, South China Normal University, Guangzhou 510006, China

[‡] Engineering Research Center of MTEES (Ministry of Education), Research Center of BMET (Guangdong Province), Engineering Lab. of OFMHEB (Guangdong Province), Key Lab. of ETESPG (GHEI), and Innovative Platform for ITBMD (Guangzhou Municipality), South China Normal University, Guangzhou 510006, China

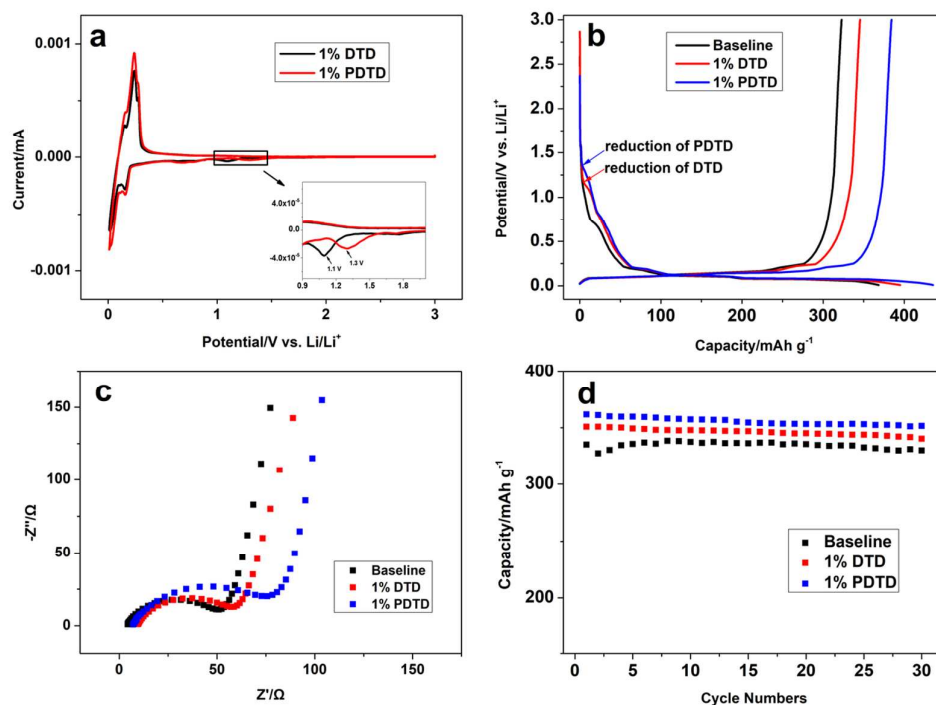


Fig. S1 (a) Cyclic Voltammetry of Li/graphite half cells in DTD and PDTD containing electrolyte at a scan rate of 0.1 mV s^{-1} ; (b) initial charge/discharge profiles of Li/graphite half cells at 0.1 C rate; (c) the impedance spectra after initial cycle; (d) the cyclic performance of Li/graphite half cells at 0.5 C .

Cyclic voltammograms of graphite electrodes from cells using either DTD and PDTD containing electrolyte are shown in Fig. S1a (data collected using a scan rate of 0.1 mV s^{-1}). A reductive peak at $\sim 1.1 \text{ V}$ (vs. Li/Li^+) is observed in the CV from the cell containing DTD, which is lower than that with PDTD containing electrolyte ($\sim 1.3 \text{ V}$). Higher current peak was observed in the first cycle for the anode with PDTD electrolyte than that with DTD electrolyte, indicating faster kinetics of lithiation/delithiation process in the cell with PDTD. First charge/discharge profiles of the cells with baseline electrolyte, 1% DTD added, and 1.0%PDTD added electrolyte were depicted in Fig. S1b. The coulombic efficiency (88.3%) in PDTD containing electrolyte is higher than that (87.5%) observed with the DTD containing electrolyte, this is most likely due to the more robust SEI layer was formed on the graphite with PDTD containing electrolyte. Variation of the interfacial resistance between DTD and PDTD containing electrolyte can be observed from EIS measurement. In Fig. S1c it can be seen that the electrode cycled

with PDTD containing electrolyte shows larger impedance values than the electrode cycled in DTD-containing electrolyte after initial charge/discharge cycle. This observation is thought to be because a denser and more uniform SEI films from the reduction of PDTD. Cycling behavior of Li/graphite half cells (30 cycles at a rate of 0.5 C) are presented in Fig. S1d. Cells with additive containing electrolyte show higher capacity than that of cells using baseline electrolyte. Compared to DTD, the faster kinetics of lithiation/delithiation for cells containing PDTD additive as discussed above resulted in higher capacity.

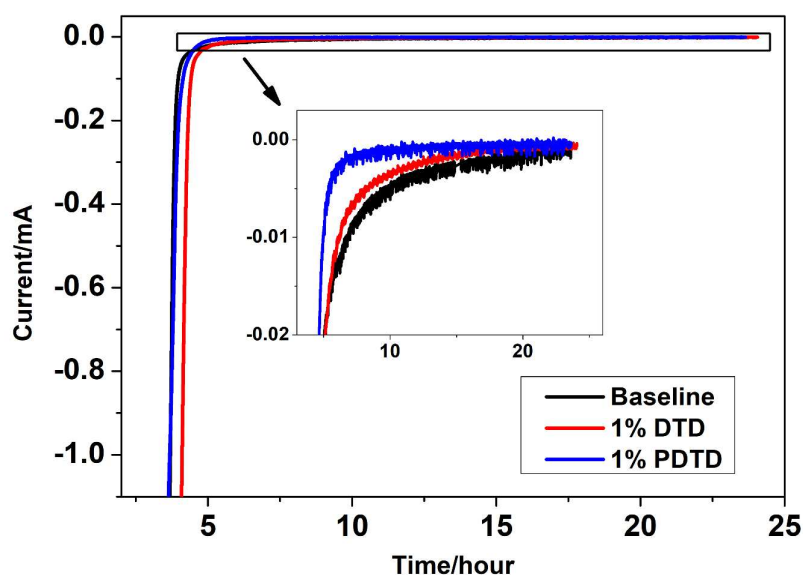


Fig. S2 Chronoamperometric response profiles of Li/graphite half cells in baseline and DTD or PDTD containing electrolyte.

The suppression of electrolyte decomposition by the SEI film formed from DTD and PDTD can be observed by comparison of the floating current under a low potential of 5 mV, vs. Li/Li^+ . The potentiostatic profiles of graphite electrodes illustrated in Fig. S2 show that after three charge/discharge cycles, the Li/graphite half cells discharge to 0.005 V, followed by a constant voltage of 5 mV for 20 h. The reduction residual current for the electrolyte with PDTD is much lower than that of the baseline electrolyte and DTD containing electrolyte, suggesting more robust SEI formed on the electrode surface in PDTD containing electrolyte.