Effect of prop-1-ene-1,3-sultone on the Performances of Lithium Cobalt Oxide/Graphite Battery Operating Over a Wide Temperature Range

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In this paper, we find that prop-1-ene-1,3-sultone (PES) must be a promising additive for the lithium ion battery operating over a wide temperature range. The effect of PES on the graphite anode and LiCoO₂ cathode is systematically studied by cyclic voltammetry (CV), charge-discharge test, scanning electron microscopy (SEM), and X-ray photoelectron spectroscopy (XPS). The results demonstrate that PES could be reduced prior to the ethylene carbonate (EC) and formed a more stable SEI film on the graphite anode. Meanwhile, the PES could also form a film on LiCoO₂ electrode. For these reasons, the LiCoO₂/artificial graphite (AG) battery using PES additive exhibits an excellent high temperature performances. The battery with PES additive could bear 2C charge/discharge cycle under 70°C and the capacity retention could reach 90.1% after 300 cycles. Although PES additive will little increase the resistance of LiCoO₂/AG cells and harm its low temperature performance, the discharge capacity retention of the battery with 1% PES can still reach 75% at -40°C. This demonstrates that PES must be a very promising additive for the battery operating over a wide temperature range.

Keywords: Lithium-ion battery, Electrolyte additive, Prop-1-ene-1,3-sultone, low temperature performance, high temperature performance, wide temperature range

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