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

Wenfeng Song\textsuperscript{1,2}, Bo Hong\textsuperscript{1,*}, Shu Hong\textsuperscript{1,*}, Yanqing Lai\textsuperscript{2}, Jie Li\textsuperscript{2}, Yexiang Liu\textsuperscript{2}

\textsuperscript{1} School of Materials Science and Engineering, Central South University, Changsha, Hunan 410083, China
\textsuperscript{2} School of Metallurgy and Environment, Central South University, Changsha Hunan 410083, China;
\textsuperscript{*}E-mail: miaoshoushu1234@163.com and bop_hong@163.com

doi: 10.20964/2017.11.84

Received: 30 July 2017 / Accepted: 19 September 2017 / Published: 12 October 2017

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 LiCoO\textsubscript{2} 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 LiCoO\textsubscript{2} electrode. For these reasons, the LiCoO\textsubscript{2}/ 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\textdegree C and the capacity retention could reach 90.1\% after 300 cycles. Although PES additive will little increase the resistance of LiCoO\textsubscript{2}/AG cells and harm its low temperature performance, the discharge capacity retention of the battery with 1\% PES can still reach 75\% at -40\textdegree C. This demonstrates that PES must be a very promising additive for the battery operating over a wide temperature range.

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

\textbf{FULL TEXT}

© 2017 The Authors. Published by ESG (www.electrochemsci.org). This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution license (http://creativecommons.org/licenses/by/4.0/).