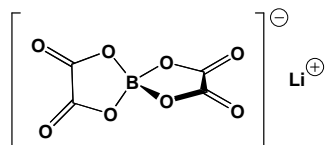


Formation of Graphite/Electrolyte Interface in LiBOB-based Electrolytes

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Lithium bis(oxalato)borate (LiBOB) was reported as a potential salt for Li-ion electrolyte 2 years ago.^{1,2}



Since then a series of electrochemical tests were conducted at ARL on this new salt, and two major uniqueness of it have been revealed:

- (1) The excellent thermal stability of LiBOB enables the electrolytes based on it to operate at elevated temperatures in Li-ion cells with negligible capacity fading;³
- (2) LiBOB-based electrolytes can effectively stabilize graphite structure, even when the electrolyte solvent is PC.⁴

The above merits of this new salt, when compared with LiPF₆, clearly lead to the conclusion that BOB-anion is actively involved in the formation of a solid electrolyte interface (SEI) on graphite anode, and an SEI with most likely new chemical composition has been formed.

In order to gain further understanding of the mechanism involved during the formation of SEI on graphite by BOB-anion, we used electrochemical means to determine the potential range where an effective protection of graphite is established.⁵ Spectroscopic means were also used to study the chemical composition of this new SEI. This report will summarize our preliminary results in those recent efforts.

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3. K. Xu, S. Zhang, T.R. Jow, W. Xu, and C. A. Angell, *Electrochem. and Solid State Lett.*, **5**, A26 (2002);
4. K. Xu, S. Zhang, B.A. Poese, T.R. Jow, *Electrochem. and Solid State Lett.*, **5**, A259 (2002);
5. K. Xu, S. Zhang, T.R. Jow, *Electrochem. and Solid State Lett.*, to be published.

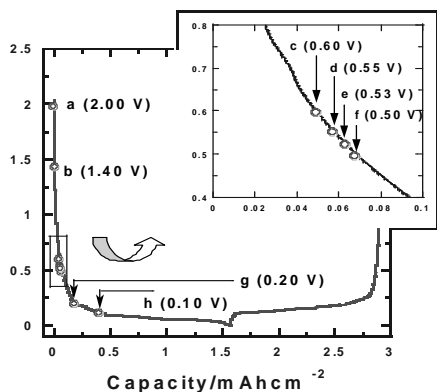


Fig.1 The galvanostatic lithiation/de-lithiation of a graphite anode in LiBOB/PC. The "pre-formation" potentials are shown in the Figure and its inset.

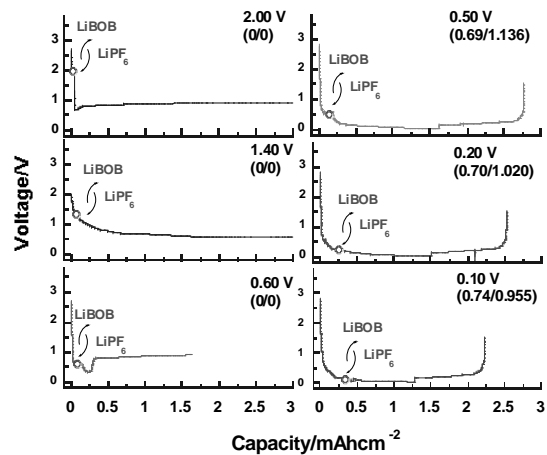


Fig.2 The voltage profiles of graphite anodes that are pre-formed in LiBOB/PC down to specific potentials and their subsequent lithiation behavior in LiPF₆/PC. The switch points of electrolytes are indicated in the Figure.

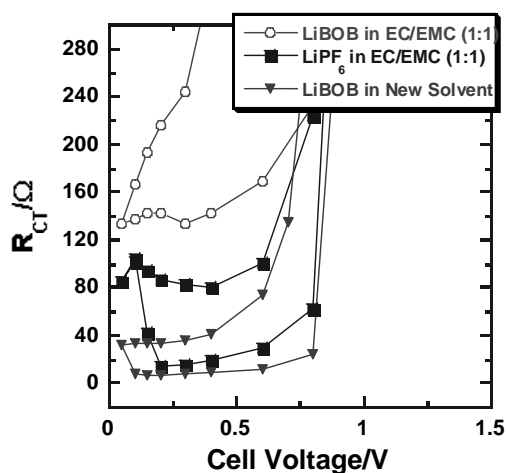


Fig.3 Cell impedance versus cell voltage for Li/graphite half cells for different electrolytes based on LiPF₆ and LiBOB, respectively.