



## Technical Notes:

**Organosilicon Electrolytes for Lithium Ion Batteries**

1. Silicon based electrolytes with polyethylene glycol oligomers improve thermal and electrochemical stability of lithium-ion batteries.
2. Increases battery long-term stability.
3. Are less flammable than conventional organic carbonate-based solvents and maintain the safe operation of batteries.
4. Improves conductivity and kinetics of the lithium salts;

**Electrochemical and Physical Properties:**

1. Viscosity 1.4 cP at 25°C, doped with 0.8M LiBOB electrolyte 1.9 cP at 25°C; **Conductivity** of 0.8M LiBOB doped electrolyte:  $1.18 \times 10^{-3} \text{ S cm}^{-1}$  at 25°C; **Thermally stable** up to 400°C. **Boiling point** 233-234°C; **Glass transition temperature** -116°C [1, 2].
2. Soluble electrolytic lithium salts: LiBOB, LiPF<sub>6</sub> (03-0325), LiBF<sub>4</sub> (03-0325 Strem product - not battery grade) and LiTFSI
3. ANL-1NM3 electrolytes show excellent charge/discharge cycling behavior in lithium-ion cells. Silane-based electrolytes with certain lithium salts are stable to 4.4 V [1]
4. Compared to other trimethylsilylated polyethyleneoxide oligomers (see also ANL-1NM2; product # 14-1925) with two and three ethylene oxide units, these electrolytic blends are advantageous for the conductivity and kinetics of the lithium salts [2]. In some cases, ANL-1NM3 is more preferable because of the higher boiling point (233-234°C vs 190-191°C of ANL-1NM2) and a lower viscosity.
5. ANL-1NM3 doped with lithium salts exhibit high ionic conductivity (more than  $10^{-3} \text{ S cm}^{-1}$ ) at room temperature. Lithium bis(oxalate)borate (LiBOB) a salt blended silicon electrolyte shows the most stable and highest electrochemical performance [3-5]. In addition, silylated electrolytes show much better electrochemical stability than carbon and germanium analogues [6].
6. Organosilicon electrolytes help to enhance the transport properties of other electrolytes [7], show excellent thermal and electrochemical stability [8] and are applicable for Li-air batteries [9]

**References:**

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