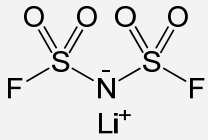
IONEL™ – Ultrapure LiFSI for High Performance Batteries

NIPPON SHOKUBAI



IONEL™
LiFSI (Lithium bis(fluorosulfonyl)imide)

IONEL™ is LiFSI used as electrolytes in Lithium-ion batteries. Nippon Shokubai developed mass-production technology for LiFSI using proprietary synthesis and refining techniques for the first time in the world in 2013.

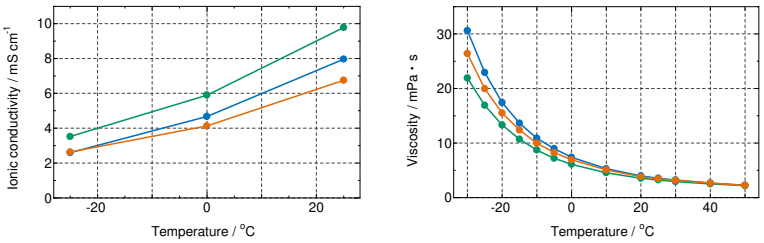
We have applied for patents suitable for Lithium-ion battery applications all over the world and own many patent rights. It complies with laws and regulations in major countries, so customers can use it with confidence in terms of quality and intellectual property.

Basic properties

Physical properties

	LiFSI	$LiPF_6$	LiTFSI
Molecular weight	187.1	151.9	287.1
Ionic conductivity (mS/cm)	9.8	8.0	6.8
Thermal decomposition temperature (°C)	308	154	337

Ionic conductivity and viscosity



1.0M $LiPF_6$ EC/MEC=3/7
1.0M LiTFSI EC/MEC=3/7
1.0M LiFSI EC/MEC=3/7

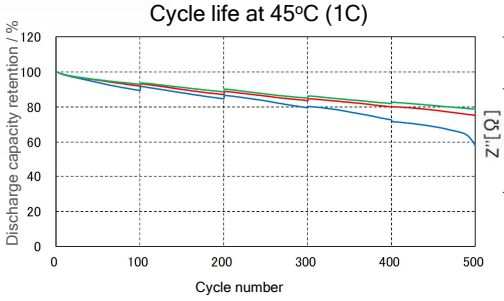
LiFSI-based electrolytes show higher ionic conductivity and lower viscosity.

Battery Evaluation

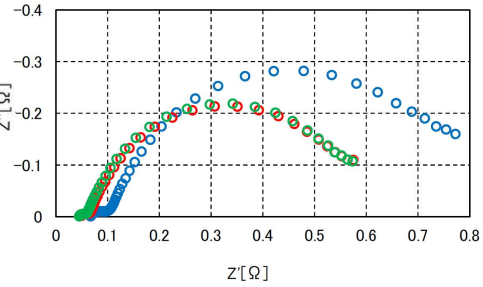
LiFSI-containing electrolytes show excellent cycle stabilities, high-rate and low-temperature performances.

NMC(811)/Graphite

Cycle life at 45°C (1C)



Impedance after 500 cycles (SOC 100%)



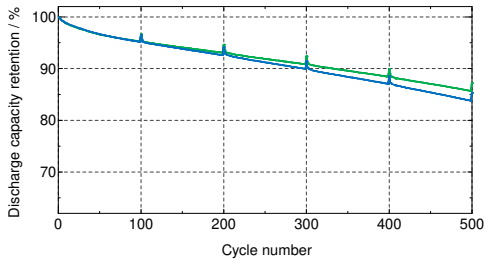
1.2M $LiPF_6$ EC/MEC=3/7
0.2M LiFSI+1.0M $LiPF_6$ EC/MEC=3/7
0.6M LiFSI+0.6M $LiPF_6$ EC/MEC=3/7

Cell
- Cathode : NMC811
- Anode : Natural graphite
- Separator : PE 20 µm
- Jellyroll type-laminated cells (1080 mAh)

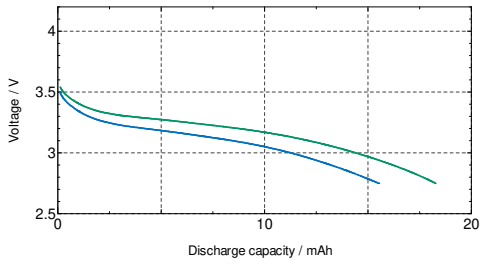
Evaluated by LIBTEC

NMC(811)/SiO_x

Cycle life at 45°C (1C)



Discharge performance at −20°C (1C)

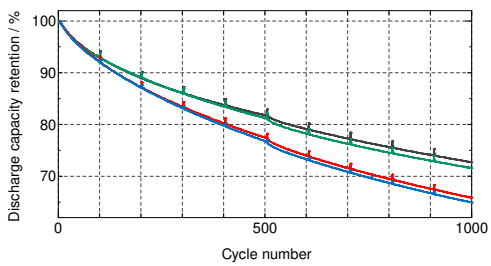


1.2M $LiPF_6$ EC/MEC=3/7
0.6M LiFSI+0.6M $LiPF_6$ EC/MEC=3/7

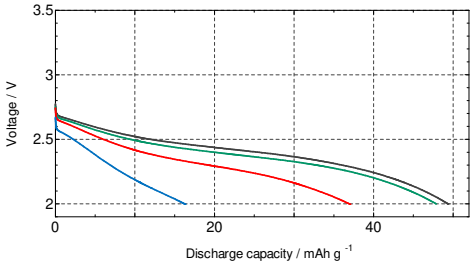
Cell
- Cathode : NMC811
- Anode : SiO_x (Shin-Etsu Chemical KSC-1265) : Artificial graphite = 20:80 (wt/wt)
- Separator : PE 25 µm
- Single-layer laminated cells (30 mAh)

$LiFePO_4$/Graphite

Cycle life at 45°C (1C)



Discharge performance at −20°C (1C)



1.2M $LiPF_6$ EC/MEC=3/7
0.2M LiFSI+1.0M $LiPF_6$ EC/MEC=3/7
0.6M LiFSI+0.6M $LiPF_6$ EC/MEC=3/7
1.0M LiFSI+0.2M $LiPF_6$ EC/MEC=3/7

Cell
- Cathode : LiFePO4
- Anode : Natural graphite
- Separator : PE 25 µm
- Single-layer laminated cells (30 mAh)