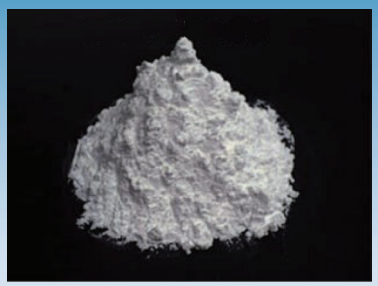
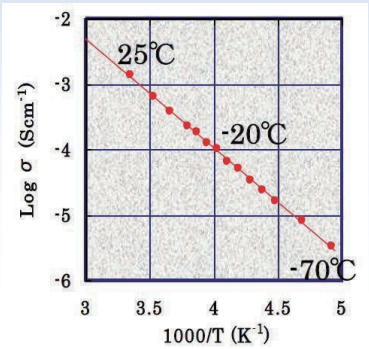
Lithium Ion Conducting Glass-ceramics (LICGC™ PW-01)



LICGC™ PW-01 is a lithium ion conducting glass ceramics powder that can be used as an inorganic electrolyte or a cathode additive in lithium ion secondary batteries.

This highly conductive, non-flammable, powder is stable in air and water.

When used as a cathode additive, LICGC™ PW-01 can lead to significant improvements in the discharge capacity at higher rates and reduced charge times .
An increased discharge capacity can also be seen at low temperatures.

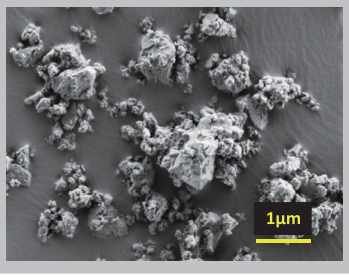
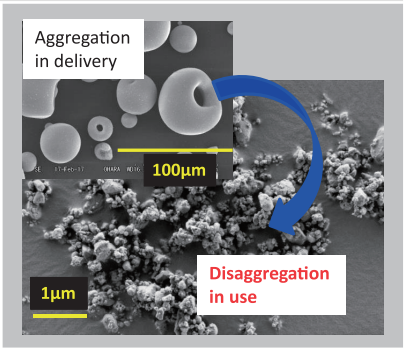


Arrhenius plot of LICGC™ PW-01

Advantages:

- High lithium ion conductivity:
  1 x 10^{-3} S/cm at 25℃.
  Highest values achieved in a solid electrolyte
- Suitable for use as an inorganic electorolyte
- Suitable for use as a cathode additive
- Excellent physical, mechanical & chemical properties
  Stable in air and water
  Non-flammable and safe
- Supplied as 1μm and 0.4μm average particle size
- Enables increased discharge capacity & faster charge times

LICGC™ PW-01 (Ave. Particle Size 1 μm & 0.4μm)

	Ave. 1μm (D-50)	Ave. 0.4μm (D-50)
Material Composition	Li_2O-Al_2O_3-SiO_2-P_2O_5-TiO_2 system	
Main Crystalline Phase	$Li_{1+x+y}Al_xTi_{2-x}Si_yP_{3-y}O_{12}$ (Li replaced NASICON type)	
Specific Gravity	2.8	
BET(m^2/g)	11	18
Ion Conductivity(S/cm,25℃)	$1x10^{-3}$	
Chemical Properties	RW(p) JOGIS1(Water resistance), RA(p) JOGIS1(Acid resistance) Fully stable in air	
SEM Image		

※Above-mentioned properities are reference values and are not guaranteed.
Properties are subject to change as our products are developed.

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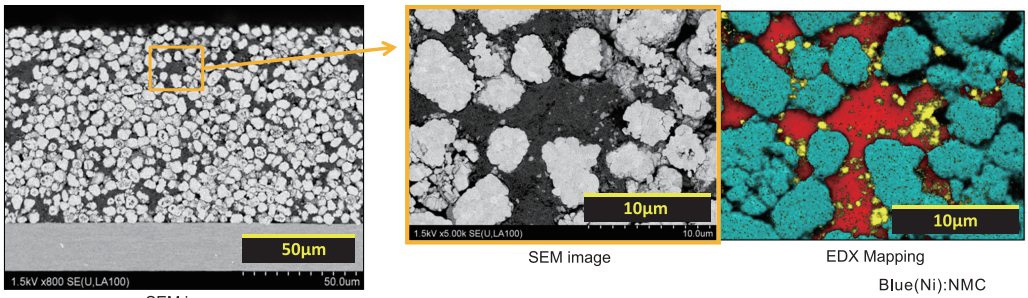
Properties of cathodes utilizing LICGC™ PW-01 as an additive

The cross section SEM image of NMC cathode added 1wt% LICGC™ PW-01



SEM image

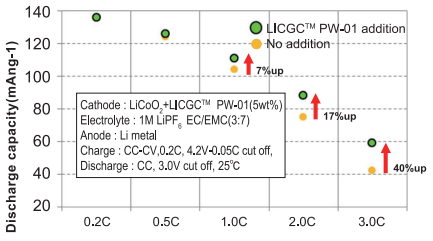
SEM image

EDX Mapping

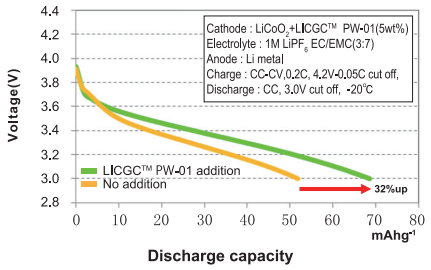
Blue(Ni):NMC
Red(C):AB+PVdF
Yellow(P):LICGC™ PW-01

Cross section SEM image of NMC cathode utilizing LICGC™ PW-01 as an additive. This cathode was fabricated by casting a slurry containing the composite materials NMC, carbon, binder, NMP and LICGC™ PW-01 onto Al foil.

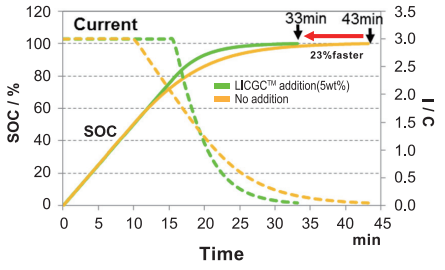
Increased capacity at high rate (LCO)



Iccreased capacity at low temperature (LCO)



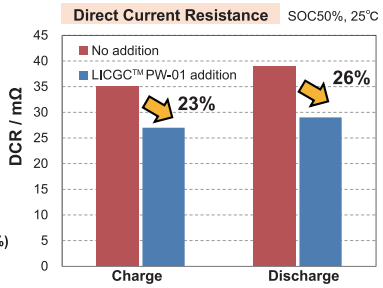
Shorten charge time at high rate (LCO)



The improved performance by the addition of LICGC™ PW-01 to NMC/C_6 full cell

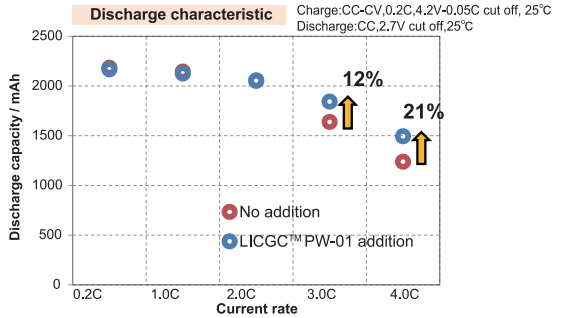
Propertoes of Cathode (NMC)utilizing LICGC™ PW-01 as an additive

Cathode : NMC+LICGC™ PW-01 (1wt%)
Anobe : C_6
Electrolyte : 1M $LiPF_6$ EC/DEC(1:1)
Capacity : 2200mAh



The direct current resistance of NMC/C_6 full cell as same as half cell is decreased by adding LICGC™ PW-01 to NMC cathode.

Properties of Cathode (NMC) utilizing LICGC™ PW-01 as an additive



The discharge capacity of NMC/C_6 full cell as same as half cell is increased by LICGC™ PW-01 to NMC cathode.

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