

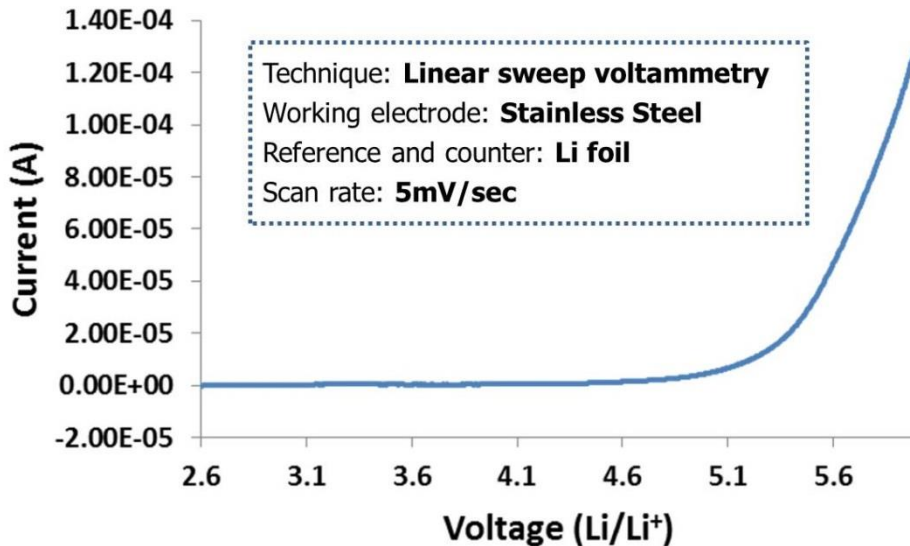
NANOMYTE® SE-50 is a hybrid polymer-ceramic solid electrolyte for use in solid state lithium batteries. The two key challenges for achieving high performance solid state batteries are the low ionic conductivity of many solid electrolytes and the large impedance posed by the electrode-electrolyte interface. SE-50 addresses these challenges by having a high Li⁺ ionic conductivity, combined with low interfacial resistance between the electrodes and solid electrolyte. These properties are enabled by the unique elastomeric self-adhesive properties of the solid electrolyte. In addition, NANOMYTE® SE-50 has excellent electrochemical stability, which allows its use with high voltage cathode materials.

PHYSICAL CHARACTERISTICS

Components:	Polymer – Ceramic Composite Material with Lithium Salt
Form:	Solid monolith
Color:	Yellowish / off-white
Crystallinity:	Amorphous
Solubility:	Common polar organic solvents

TECHNICAL DATA

Glass Transition Temperature:	< -40°C (DSC)
Stable Temperature Range:	up to 150°C
Ionic Conductivity:	2 - 4 x 10 ⁻⁴ S/cm (@ RT)
Stability Window:	Up to 5.2V (Li/Li ⁺)
Interfacial resistance with Li:	170 ohms/cm ²
Capacity at 0.04C (NMC):	≥ 190 mAh/g (with NMC811)
Capacity at 0.04C (LFP):	≥ 150 mAh/g (with LiFePO ₄)



Voltage Stability for SE-50

PROCESSING INSTRUCTIONS

NANOMYTE® SE-50 solid electrolyte can be cast either into a free standing film, or directly onto a cathode tape for cell assembly. Procedures to cast films and fabricate cells are described below. (***Note:** It is important to protect the material from moisture. SE-50 can be handled in a dry room for short periods of time. See Storage & Handling for more details.*)

Thin Film Preparation:

Dissolve 20 – 30 wt. % of SE-50 in acetonitrile and mix vigorously until SE-50 dissolves completely. Cast on Teflon® or any other non-stick sheet with the desired thickness in argon or nitrogen atmosphere until the solvent evaporates, and then dry in vacuum at 60 °C for 2 hours.

Cell Preparation:

When fabricating cells, NANOMYTE® SE-50 is incorporated into the electrode tape in order to confer ionic conductivity to the electrode. This is in contrast to cells using a liquid electrolyte, where the liquid electrolyte molecules can get access to the pores in the electrode. When used in conjunction with traditional binders, such as PVDF, SE-50 serves as a conductive binder to afford Li⁺ conductivity in the electrodes and reduce the interfacial resistance between the cathode and electrolyte. An example cathode composition comprises of 70% cathode material (by weight), 15% NANOMYTE® SE-50, 10% carbon black, and 5% PVDF.

After the cathode containing NANOMYTE® SE-50 is fabricated, the solid electrolyte can then be cast directly onto the cathode tape. For this purpose, make a solution of SE-50 in acetonitrile (e.g., 30 wt%) and cast it onto the electrode tape. Let the solvent dry in argon or nitrogen atmosphere (or a dry room) until the coating appears dry, and then transfer to vacuum drying at 60 °C for 2 hours. The cathode and separator layers can then be combined with the anode to complete cell assembly.

PRODUCT PACKAGING & QUANTITIES

SE-50 is offered in lots of 10g, 25g, 50g, & 100g (or larger) quantities and is available in three forms:

- **NANOMYTE® SE-50** is a bulk solid
- **NANOMYTE® SE-50A** is a 30% SE-50 solution in Acetonitrile
- **NANOMYTE® SE-50N** is a 30% SE-50 solution in NMP

Note: All weights refer to the solids content (polymer-ceramic)

STORAGE & HANDLING**Precautions for Safe Handling**

Material is hygroscopic – protect from moisture and humidity. Handle in a controlled environment, preferably in a glovebox under inert gas. Material may also be handled in a dry room for a few hours at a time. Appropriate personal protective equipment should be used at all times. Avoid contact with eyes, skin, and clothing. Provide appropriate exhaust ventilation and avoid inhalation of dust, vapors, or mist.

If product is dispersed in solvent, keep away from sources of ignition – no smoking. Take measures to prevent the buildup of electrostatic charge. For additional precautions, see Safety Data Sheets.

Conditions for Safe Storage

Best stored under inert gas. Keep container tightly sealed, in a cool, dry, and well-ventilated place. This material is moisture sensitive. Protect from humidity and keep away from water. Keep away from oxidizing agents. Store in a locked cabinet or with access restricted to technical experts or their assistants. If product is dispersed in solvent, be sure that opened containers are carefully resealed and kept upright to prevent leakage.

Refer to the SDS for complete information on the safe use, storage, and handling of this material.

NOTE: NEI Corporation believes that the information in this spec sheet is an accurate description of the typical use of the product. However, NEI disclaims any liability for incidental or consequential damages, which may result from the use of their products that are beyond its control. Employers should use this information only as a supplement to other information gathered by them and should make independent judgment of suitability of this information to ensure proper use and protect the health and safety of employees. Therefore, it is the user's responsibility to thoroughly test the product in their particular application to determine its performance, efficacy, and safety. Nothing contained herein is to be considered as permission or a recommendation to infringe any patent or any other intellectual right.