Chemicals

Powering the future together

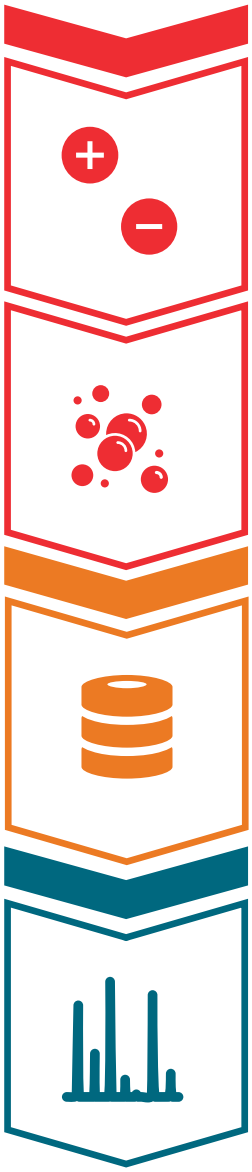
Chemicals and materials for research, production, and analysis

Contact us for more information on our battery products

thermo scientific | Chemicals

Chemicals for batteries: A total workflow solution

Whether you are engaging in research for the next cation alternative with inorganics and ligands or finding new organic molecules to tap on their resonance abilities for ion transfer, or post-reaction analysis on samples, we have a complete line of solutions for your battery research workflow. Read about how our capabilities and our products can help bring success to your battery research.



Our lab-to-line workflow

Formulation chemicals & materials for anode, cathode and electrolytes

- ✓ Extensive range of **pure metals** such as lithium and copper foil, magnesium turnings, and more.
- ✓ **Organic chemicals** used to enhance electrochemical performance.
- ✓ High-quality **inorganic** salts, such as lithium hexafluorophosphate and lithium perchlorate.
- ✓ Acroseal™ packaging, to help ensure that reagents are **protected against air and moisture** for a longer shelf-life.

Production and bulk capabilities

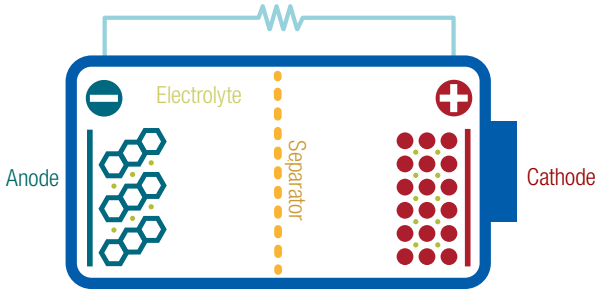
- ✓ Global sourcing network enables supply reliability
- ✓ Customized delivery schedule to meet your project timelines
- ✓ Mixed blends

Elemental analysis and methods

- ✓ A comprehensive line of spectrochemical analytical standard solutions. Specpure™ products are available from **stock, ready for immediate shipment.**

Energy cell formulation materials

A battery's core components consist of an anode, cathode, electrolyte, and separator. For areas in research pertaining to each of these core components, Thermo Fisher Scientific provides **high-quality** metals, metal-oxides, ligands, and other raw materials to aid you in successful research.



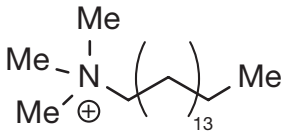
Cathode formulation materials

The cathode is a source of ions which determines the capacity, as well as the average voltage of a battery. Thermo Scientific offers a **wide portfolio** of lithium-based sources for the traditional research, as well as a variety of salts for battery research.

Examples of inorganic materials used in battery research

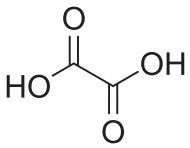
CAS No.	Catalog No.	Product Description	Formula
7429-90-5	040682	Aluminum Ultrathin foil, 0.0075 micron thick, 99.995% (metals basis)	Al
12057-24-8	041832	Lithium oxide, 99.5% (metals basis)	Li_2O
12190-79-3	042090	Lithium Cobalt (III) Oxide, 99.5% metals basis (LCO)	$LiCoO_2$
12057-17-9	040250	Lithium Manganese (III, IV) oxide, 99.5% (metals basis)	$LiMn_2O_4$
1310-66-3	H36379	Lithium hydroxide monohydrate, battery grade	LiOH
554-13-2	010734	Lithium carbonate, Puratronic™, 99.998% (metals basis excluding Ca), Ca LT 20 ppm	Li_2CO_3
1313-99-1	010819	Nickel(II) oxide, Puratronic™, 99.998% (metals basis)	NiO
1313-13-9	010805	Manganese(IV) oxide, Puratronic™, 99.996% (metals basis)	MnO_2
6156-78-1	010802	Manganese(II) acetate tetrahydrate, Puratronic™, 99.999% (metals basis)	$Mn(CH_3COO)_2{\cdot}4H_2O$
10034-96-5	A17615	Manganese(II) sulfate monohydrate, 99%	$MnSO_4{\cdot}H_2O$
6147-53-1	044345	Cobalt(II) acetate tetrahydrate, 99.999% (metals basis)	$Co(CH_3COO)_2{\cdot}4H_2O$
1308-06-1	045806	Cobalt(II,III) oxide, 99.7% (metals basis), 2 to 6 µm powder	Co_3O_4
12136-58-2	012839	Lithium sulfide, 99.9% (metals basis)	Li_2S
6018-89-9	010813	Nickel(II) acetate tetrahydrate, Puratronic™, 99.999% (metals basis)	$Ni(CH_3COO)_2{\cdot}4H_2O$
10101-97-0	053130	Nickel(II) sulfate hexahydrate, 99.97% min (metals basis)	$Ni_2SO_4{\cdot}6H_2O$
12030-49-8	043396	Iridium(IV) oxide, Premion™, 99.99% (metals basis), Ir 84.5% min	IrO_2
50926-11-9	042677	Indium tin oxide, Vacuum Deposition Grade, 99.99% (metals basis)	In_2-xSn_x-O_3

Examples of organic materials used in battery cathode research



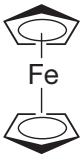
(1-Hexadecyl)trimethylammonium bromide (CTAB), 99+%,

Cat. No: 22716
CAS No: 57-09-0



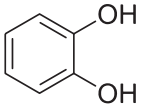
Oxalic acid dihydrate, 98%,

Cat. No: A13866
CAS No: 6153-56-6



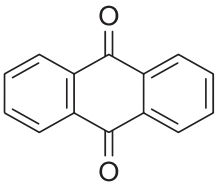
Ferrocene, high purity, 99+%,

Cat. No: 087202
CAS No: 102-54-5



Catechol, 99+%

Cat. No: 15898
CAS No: 120-80-9



9,10-Anthraquinone, 98+%

Cat. No: 10493
CAS No: 84-65-1

Anode formulation materials

Much of today's research is centered around increasing the anode's capacity and thereby battery performance. The combination or single-use of various metals, inorganic complexes, and organic materials are being explored in various research fields. Ranging from inorganic compounds to organic materials exhibiting various behaviors (e.g. **aromaticity, resonance, conjugation,** etc.), Thermo Scientific has the products you need to fulfil your anode research workflows.

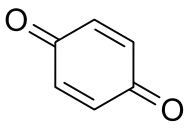
Examples of inorganic materials used in battery anode research

CAS No.	Catalog No.	Product Description	Formula
7440-50-8	010950 042972	Copper foil, 0.025mm (0.001in) thick, Puratronic™, 99.999% (metals basis) Copper foil, 0.05mm (0.002in) thick, Puratronic™, 99.9999% (metals basis)	Cu (0)
7439-93-2	010767	Lithium foil, 1.5mm (0.06in) thick x 100mm (3.9in) wide, 99.9% (metals basis)	Li (0)
7440-21-3	046308 044384	Silicon powder, crystalline, APS ≈ 100 nm, 99%, Plasma synthesized Silicon powder, crystalline, APS | <50 nm, 98%, Laser synthesized from vapor phase	Si (0)
7782-42-5	040798 040797 014734	Graphite powder, synthetic, conducting grade, -325 mesh, 99.9995% (metals basis) Graphite powder, synthetic, conducting grade, -200 mesh, 99.9995% (metals basis) Graphite powder, natural, high purity, -200 mesh, 99.9998% (metals basis)	C
7782-42-5	010832 043078	Graphite foil, 0.254mm (0.01in) thick, 99.8% (metals basis) Graphite foil, 0.13mm (0.005in) thick, 99.8% (metals basis)	C
1333-86-4	H30253 039724 045527	Carbon black, Conductive, 99+% (metals basis) Carbon black, acetylene, 50% compressed, 99.9+% Carbon black, acetylene, 100% compressed, 99.9+%	C
1317-80-2	014631	Titanium(IV) oxide, rutile, 99.99% (metals basis)	TiO_2
10102-25-7	044352	Lithium sulfate, anhydrous, 99.99% (metals basis)	Li_2SO_4
10377-52-3	010743	Lithium phosphate, Puratronic®, 99.99% (metals basis)	Li_3PO_4

Examples of organic materials used in battery anode research

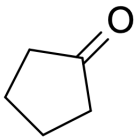
Fullerene, carbon nanotube, multi-walled, ≤8 nm OD, 2-5 nm ID, 0.5-2 micron long

Cat. No: 044790
CAS No: 308068-56-6



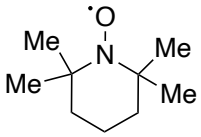
p-Benzoquinone, 98+%,

Cat. No: A13162
CAS No: 106-51-4



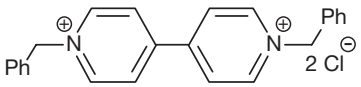
Cyclopentanone, 99+%, pure,

Cat. No: 011153
CAS No: 120-92-3



TEMPO, free radical, 98+%,

Cat. No: A12733
CAS No: 2564-83-2



Benzoyl viologen dichloride, 97%,

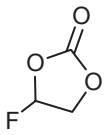
Cat. No: H66836
CAS No: 1102-19-8

Electrolyte formulation materials

Transporting positively charged ions between the anode and cathode, the electrolyte is a key component of any battery cell. Our range of organic compounds from Thermo Scientific will be able to help you through your research requirements, particularly in these classes of compounds:

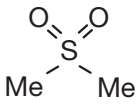
1. **Conjugated Hydrocarbons:** These include various olefins, alkynes, and conjugated pi structures.
2. **Heterocyclics:** Cyclic compounds which contain atoms from at least two different elements in the ring, and include nitrogen, oxygen, phosphorous, sulfur, and mixed heterocycles.
3. **Aromatics:** Examples include benzene or pyridine and its derivatives.
4. **Carbonyls:** Oxygen-containing compounds include aldehydes, ketones, esters, and carboxylic acids and its derivatives.

Examples of materials used in electrolyte research



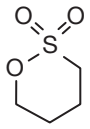
4-Fluoro-1,3-dioxolan-2-one 98.0%

Cat. No: H61502
CAS No: 114435-02-8



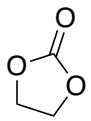
Dimethyl sulfone, 99%,

Cat. No: B21747
CAS No: 67-71-0



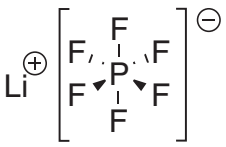
1,4-Butanesultone, 99%

Cat. No: L03992
CAS No: 121-43-7



Ethylene carbonate, 99%,

Cat. No: A15735
CAS No: 96-49-1



Lithium hexafluorophosphate ($LiPF_6$), 98%

Cat. No: 011529
CAS No: 21324-40-3

Supporting your production needs

Custom and Bulk (C&B) chemical services at a glance

When you are ready to take your research into the production stage, we can bridge that gap by providing end-to-end customer solutions to serve specialty fine chemical and analytical solvent needs.

Through our extensive global network of over 3,000 chemical suppliers, trust us to manage your entire process – supply chain management and logistics. You will get the quality, ready-to-use, chemicals you need shipped to your schedule.

Summary of capabilities:

1. Supply Chain Management

This allows our customers to **simplify scale-up costs** effectively and it **drives efficiency** in handling, storage, and product integrity. At the same time, confidently manage and source the chemicals you need throughout your entire workflow with our custom and bulk chemical services.

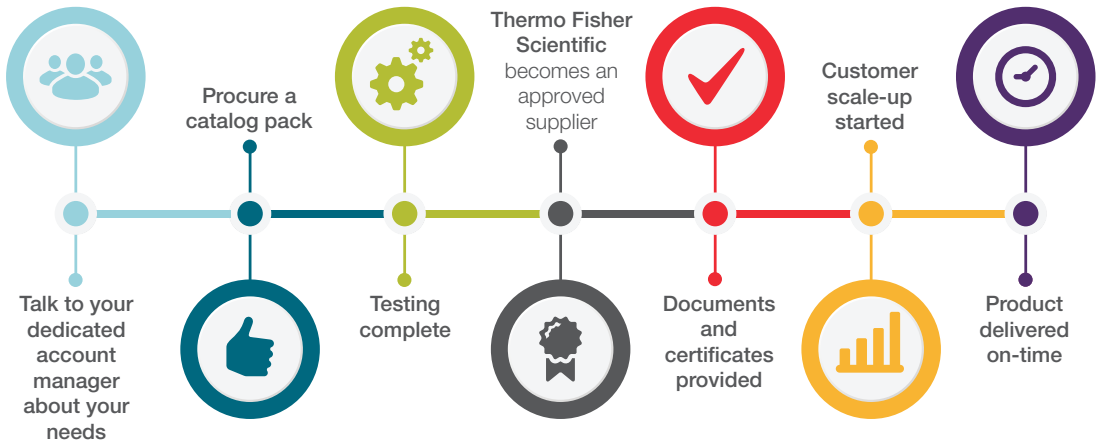
2. Customization

As part of understanding our customers' stringent requirements, we offer tailor-made specifications, blending, packaging, labeling, documentation, and delivery schedule. Custom specifications are also incorporated into the corresponding certificate of analysis (CoA) of these products.

3. Mixed blends

Chemicals that are compatible for mixing can be done so through our manufactured blends.
This have the potential to **save time, reduce waste**, and bring about consistent quality every single time.

Your journey guide



We enable our customers to focus on results with a fully managed service.

Elemental analysis and methods

Thermo Scientific™ Specpure™ analytical standards

Our range of Thermo Scientific Specpure™ products is our comprehensive offering of spectrochemical analytical standard solutions.

Specpure standards are unsurpassed in accuracy, purity and quality. Our atomic absorption standards solutions are accurate to ±1.0% and the plasma solutions to ±0.3%.

Specpure™ atomic absorption standards

These solutions are intended for use with either flame or furnace absorption spectroscopy. Our standards are the most frequently used instrumental technique for elemental analysis. The Thermo Scientific range offers 70 single element aqueous solutions at 1,000 µg/mL in both 100 mL and 500 mL sizes.

Specpure™ plasma standards

These solutions are intended for ICP-OES, ICP-MS, XRF, and other techniques for elemental analysis. These techniques are capable of determining the concentrations of many elements **quickly**, either **simultaneously** or **sequentially**.

Features of Specpure™ analytical standards

- A NIST-traceable Certificate of Analysis is included with each standard solution
- These standards are ISO9001, ISO Guide 34, and ISO/IEC17025
- Expiration date stickers are included with each standard solution
- Certified accuracy of ±1.0% for atomic absorption standards and ±0.3% for plasma solutions from the stated concentration

Additional resources

Learn more about our products in detail through our Analytical standards brochure

Scan the QR code to download

Browse the complete portfolio of products supporting battery research and manufacturing. For more information visit: **thermofisher.com/battery-chemicals**

Contact us for more information on our battery products

thermo scientific | Chemicals