



Includes
NEW
Chemistries
for Battery
& PV

ENERGY RESEARCH

Product Overview

A BOND WORTH FORMING

WE ENABLE INNOVATION

For over 30 years we've been enabling you to accelerate your research and development, proudly partnering with the most innovative minds in the science and technology sectors.

We're purpose designed to support your science and technology innovation, and take your ideas from lab-based concepts to full-scale production.

With our capabilities and extensive expertise we're the partner of choice for custom manufacturing solutions and niche product sourcing through our trusted network of UK and international suppliers.

Specialising in the following areas:

- Energy Research
- Hydrogen Technology
- Photonics + Optoelectronics
- Thin Films + Nanotech
- Materials Processing + Testing
- RF Shielding
- Electroforming
- Specialist Metallic Coatings

Accelerate your journey. We are PI-KEM.

MICRO-INFO

- 30+ years supplying advanced materials and equipment
- Custom manufactured components
- Niche product sourcing
- Comprehensive range of standard stock products and consumables
- Call off purchase options
- Support from an expert scientific team
- Low minimum order quantity
- UK, European and global delivery

We offer a wide range of advanced materials and equipment which are available as standard or custom manufacture.

Within this catalogue are our most requested lines, however we welcome any enquiry for other specifications.

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Our Partners

We distribute on behalf of leading manufacturers of advanced materials and equipment



Battery + Supercapacitors:

MATERIALS

We offer a wide range of materials for your battery and supercapacitor research.

Below are our most requested lines, we welcome your enquiry for other specifications

Product	Description
1 Custom coated electrode sheets Wide range of standards Custom specifications available - Active material loading - Coating thickness - Binder type	Anode Materials Cu foil, single or double side coated by: - Graphite - Activated Carbon - Chemistry-specific coatings Cathode Materials Al foil, single or double side coated by: - Chemistry-specific coatings
2 Pre-cut Coin Cell Discs Simplify your coin cell research with our pre-cut discs, eliminating the need for slurry preparation, coating, drying, calendaring, and cutting	- Graphite Coated Anode Electrodes - LiCoO₂ Single Side Coated Cathode Electrode - LiFePO₄ Single Side Coated Cathode Electrode - LiNiCoMnO₂ Single Side Coated Cathode Electrode - NaNi_{1/3}Fe_{1/3}Mn_{1/3}O₂ Layered Oxide Single Side Coated Cathode Electrode - Na₃V₂(PO₄)₃ Single Side Coated Cathode Electrode - Polypropylene (PP) Separator - Whatman Pre-Cut Glass Fiber Membrane
3 Electrolytes - Solid State - Liquid	Standard and customised electrolyte formulations for a range of battery chemistries. See page 10-11.
4 Cathode & Anode Active Materials - Li-ion - Na-ion - Zn-ion - Mg-ion	Available in a range of forms: - Powders - Pre-coated foil sheets - Discs & Chips
5 Metal Foils	- Aluminium (Al) - Carbon (C) - Copper (Cu) - Nickel (Ni) - Stainless Steel - Tantalum (Ta) - Titanium (Ti) - Tungsten (W) - Vanadium (V) - Zirconium (Zr)
6 Mesh	- Aluminium (Al) - Copper (Cu)
7 Foam	- Cobalt (Co) - Graphene - Nickel (Ni) - Silver (Ag) - Titanium (Ti)



Battery + Supercapacitors:

NEW BATTERY CHEMISTRIES

Zn-ion
Mg-ion

As the demand for safer, more sustainable and lower-cost energy storage solutions continues to grow, Zn-ion and Mg-ion batteries are emerging as promising alternatives to conventional battery technologies.

To support your research in these rapidly evolving fields, we offer a selection of high-quality chemicals and components, including zinc and magnesium battery materials.

ZINC CHEMICALS

- Cathode powders
- Pre-coated cathode sheets on titanium foil
- Pre-cut coated cathode discs on titanium foil
- Liquid and powder Zn-ion electrolytes
- Zinc foil and foam



Zinc Discs

For use as anodes in Zn-ion battery research.

Purity: 99.99%
Diameter: 15.6mm
Thickness: 0.1mm



MAGNESIUM CHEMICALS

- Cathode powders
- Magnesium foil
- Electrolyte powders



Battery + Supercapacitors:

LITHIUM CHEMICALS

Li-ion batteries continue to drive innovation in energy storage, with ongoing research enabling further improvements in battery capacity, safety and sustainability. We provide Li-ion battery materials in a wide range of forms and chemistries to support your academic and industrial research programmes.

Below are our most requested lines, we welcome your enquiry for other specifications

Li-Ion Cathode & Anode Powders

Anode Powders

Chemical	Formula
Carbon-coated Lithium Titanate	$\text{Li}_4\text{Ti}_5\text{O}_{12}$
Lithium Titanate	$\text{Li}_4\text{Ti}_5\text{O}_{12}$
Natural Graphite	C
Titanium Niobium Oxide	TiNb_2O_7

Cathode Powders

Chemical	Formula
LATP-coated Lithium Manganese Nickel Oxide	LMNO
Lithium Cobalt Oxide	LiCoO_2
Lithium Iron Phosphate	LiFePO_4
Lithium Manganese Oxide	LiMn_2O_4
Lithium Manganese Nickel Oxide	LMNO
Lithium Nickel Cobalt Aluminium Oxide	$\text{LiNi}_{0.8}\text{Co}_{0.15}\text{Al}_{0.05}\text{O}_2$
Lithium Nickel Manganese Cobalt Oxide	$\text{LiNi}_{0.33}\text{Mn}_{0.33}\text{Co}_{0.33}\text{O}_2$
Plus other stoichiometries	



Pre-Coated Electrode Sheets for Li-Ion Batteries

Ready to use electrode sheet, either single or double side coated on aluminium foil (cathode) or copper foil (anode) current collectors.

- **Coated Sheet Dimensions:** 5 inches x 10 inches (127 mm x 254mm)
- **Current Collectors Thickness:** Copper – 10 µm, Aluminium – 16 µm



Anode Sheets

Chemical	Formula
Activated Carbon	C
Carbon-coated Lithium Titanate	$\text{Li}_4\text{Ti}_5\text{O}_{12}$
Graphite	C
Lithium Titanate	$\text{Li}_4\text{Ti}_5\text{O}_{12}$
Silicon-Graphite Composite	Si-C

Custom Electrode Rolls

For Li-ion cylinder and pouch cells (10 - 100m)

High Loading Electrode Sheets

For Li-ion cells (10 - 100m) (4 - 5 mAh/cm²)

Pre-cut Electrodes

For Li-ion pouch cells (single and double sided)

Pre-cut Coin Cell Electrodes

(LiCoO_2 / LiFePO_4 / LiNiCoMnO_2)

Cathode Sheets

Chemical	Formula
Activated Carbon	C
Lithium Cobalt Oxide	LiCoO_2
Lithium Iron Phosphate	LiFePO_4
Lithium Manganese Iron Phosphate	$\text{LiMn}_x\text{Fe}_{(1-x)}\text{PO}_4$
Lithium Manganese Oxide	LiMn_2O_4
Lithium Manganese Nickel Oxide	$\text{LiMn}_{1.5}\text{Ni}_{0.5}\text{O}_4$
LATP-coated Lithium Manganese Nickel Oxide	$\text{LiMn}_{1.5}\text{Ni}_{0.5}\text{O}_4$
Lithium Nickel Cobalt Aluminium Oxide	$\text{LiNi}_{0.8}\text{Co}_{0.15}\text{Al}_{0.05}\text{O}_2$
Lithium Nickel Manganese Cobalt Oxide	$\text{LiNi}_{0.33}\text{Mn}_{0.33}\text{Co}_{0.33}\text{O}_2$ Plus other stoichiometries
Sublimed Sulphur	S

Lithium Discs

Lithium discs for Li-ion and Li-rechargeable battery research

Purity: 99.9%

Diameter: 12mm, 15.6mm, 16mm, 18mm

Thickness: 0.25mm, 0.45mm, 0.6mm



Battery + Supercapacitors:

SODIUM CHEMICALS

Due to sodium's abundance within the earth's crust, Na-ion battery technology is a new and fast-growing energy research area.

We offer an extensive range of materials and components to enable you to accelerate your Na-ion battery research:

Below are our most requested lines, we welcome your enquiry for other specifications

Na-Ion Cathode & Anode Powders

Anode Powders

Chemical	Formula
Sodium Metatitanate	$\text{Na}_2\text{Ti}_3\text{O}_7$
Sodium Titanium Oxide	$\text{Na}_4\text{Ti}_5\text{O}_{12}$
Sodium Titanium Phosphate	$\text{NaTi}_2(\text{PO}_4)_3$
3 wt% Carbon-coated Sodium Titanium Phosphate	$\text{NaTi}_2(\text{PO}_4)_3$

Cathode Powders

Chemical	Formula
Sodium Chromium Oxide	NaCrO_2
Sodium Cobalt Oxide	$\text{Na}_{0.7}\text{CoO}_{2+x}$
Sodium Cobalt Phosphate	NaCoPO_4
Sodium Iron Hexacyanoferrate ("Prussian Blue")	$\text{Na}_{0.61}\text{Fe}[\text{Fe}(\text{CN})_6]_{0.94}$
Sodium Iron Phosphate (maricite)	NaFePO_4
Sodium Manganese Hexacyanoferrate ("Prussian White")	$\text{Na}_{1.79}\text{Mn}[\text{Fe}(\text{CN})_6]_{0.87}$
Sodium Manganese Oxide	$\text{Na}_{0.44}\text{MnO}_2$ $\text{Na}_{0.7}\text{MnO}_{2+x}$
Sodium Manganese Phosphate	NaMnPO_4
Sodium Nickel Phosphate	NaNiPO_4



Pre-Coated Electrode Sheets for Na-Ion Batteries

Ready to use electrode sheet, either single or double sided coated on aluminium foil (cathode) or copper foil (anode) current collectors.

- **Coated Sheet Dimensions:**
5 inches x 10 inches (127 mm x 254mm)
- **Current Collectors Thickness:**
Copper - 10 μm , Aluminium - 16 μm

Anode Sheets

Chemical	Formula
Hard Carbon	C
Sodium Metatitanate	$\text{Na}_2\text{Ti}_3\text{O}_7$
Sodium Titanium Oxide	$\text{Na}_4\text{Ti}_5\text{O}_{12}$
Sodium Titanium Phosphate	$\text{NaTi}_2(\text{PO}_4)_3$
3 wt% Carbon-coated Sodium Titanium Phosphate	$\text{NaTi}_2(\text{PO}_4)_3$

Cathode Sheets

Chemical	Formula
Sodium Chromium Oxide	NaCrO_2
Sodium Cobalt Oxide	$\text{Na}_{0.7}\text{CoO}_{2+x}$
Sodium Cobalt Phosphate	NaCoPO_4
Sodium Iron Hexacyanoferrate ("Prussian Blue")	$\text{Na}_{0.61}\text{Fe}[\text{Fe}(\text{CN})_6]_{0.94}$
Sodium Iron Phosphate (maricite)	NaFePO_4
Sodium Manganese Oxide	$\text{Na}_{0.44}\text{MnO}_2$ $\text{Na}_{0.7}\text{MnO}_{2+x}$
Sodium Manganese Hexacyanoferrate ("Prussian White")	$\text{Na}_{1.79}\text{Mn}[\text{Fe}(\text{CN})_6]_{0.87}$
Sodium Manganese Phosphate	NaMnPO_4
Sodium Nickel Phosphate	NaNiPO_4

Pre-cut Electrodes

For Sodium-ion Coin Cells

$(\text{NaNi}_{1/3}\text{Fe}_{1/3}\text{Mn}_{1/3}\text{O}_2 / \text{Na}_3\text{V}_2(\text{PO}_4)_3)$

Sodium Foil

Coated on one side with 30 μm aluminium to aid current collection

Purity: 99.7%

Diameters: 120mm x 300mm

Thickness: 0.45mm



Sodium Discs

For Na-ion battery research, coated on one side with a luminium to aid current collection

Purity: 99.7%

Diameters: 0.25mm, 12.0mm, 14.0mm, 15.6mm, 18mm

Thickness: 0.45mm

ELECTROLYTES

Electrolytes play a critical role in battery performance, enabling the movement of ions between electrodes. As battery technologies continue to evolve, both liquid and solid-state electrolytes remain at the forefront of research and development.

We offer a broad range of liquid and solid-state electrolyte materials to support battery research across lithium-ion, sodium-ion and emerging next-generation chemistries.

Below are our most requested lines, we welcome your enquiry for other specifications

Solid State Electrolytes

Lithium-Based Electrolytes

Product	Formula	Type
Chlorine-rich Lithium Phosphorus Sulphur Chloride	$\text{Li}_{5.5}\text{PS}_{4.5}\text{Cl}_{1.5}$	Sulphide
Gallium-doped Lithium Lanthanum Zirconate	$\text{Li}_{6.4}\text{La}_3\text{Zr}_2\text{Ga}_{0.2}\text{O}_{12}$	Oxide
Lithium Indium Chloride	Li_3InCl_6	Halide
Lithium Phosphorus Sulphide	$\beta\text{-Li}_3\text{PS}_4$	Sulphide
Lithium Phosphorus Sulphur Chloride	$\text{Li}_6\text{PS}_5\text{Cl}$	Sulphide
Lithium Phosphorus Sulphur Chloride Iodide	$\text{Li}_6\text{PS}_5\text{Cl}_{0.9}\text{I}_{0.1}$	Sulphide
Fine "LATP" - Lithium Aluminium Titanium Phosphate	$\text{Li}_{1.4}\text{Al}_{0.4}\text{Ti}_{1.6}(\text{PO}_4)_3$	Phosphate
"LATP" - Lithium Aluminium Titanium Phosphate	$\text{Li}_{1.4}\text{Al}_{0.4}\text{Ti}_{1.6}(\text{PO}_4)_3$	Phosphate
"LAGP" - Lithium Aluminium Germanium Phosphate	$\text{Li}_{1.5}\text{Al}_{0.5}\text{Ge}_{1.5}(\text{PO}_4)_3$	Phosphate
"LLTO" - Lithium Lanthanum Titanate	$\text{Li}_{0.34}\text{La}_{0.56}\text{TiO}_3$	Oxide
Fine "LLZO" - Aluminium-doped Lithium Lanthanum Zirconate	$\text{Li}_{6.24}\text{La}_3\text{Zr}_2\text{Al}_{0.24}\text{O}_{11.98}$	Oxide
"LLZO" - Aluminium-doped Lithium Lanthanum Zirconate	$\text{Li}_{6.24}\text{La}_3\text{Zr}_2\text{Al}_{0.24}\text{O}_{11.98}$	Oxide
Fine "LLZTO" - Tantalum-doped Lithium Lanthanum Zirconate	$\text{Li}_{6.2}\text{Al}_{0.2}\text{La}_3\text{Zr}_{1.8}\text{Ta}_{0.2}\text{O}_{12}$	Oxide
"LLZTO" - Tantalum-doped Lithium Lanthanum Zirconate	$\text{Li}_{6.2}\text{Al}_{0.2}\text{La}_3\text{Zr}_{1.8}\text{Ta}_{0.2}\text{O}_{12}$	Oxide
Lithium Tin Phosphorus Sulphide	$\text{Li}_{10}\text{SnP}_2\text{S}_{12}$	Sulphide
Niobium-doped Lithium Lanthanum Zirconate	$\text{Li}_{6.75}\text{La}_3\text{Zr}_{1.75}\text{Nb}_{0.25}\text{O}_{12}$	Oxide



Sodium-Based Electrolytes

Product	Formula	Type
"NATP" – Sodium Aluminium Titanium Phosphate	$\text{Na}_{1.3}\text{Al}_{0.3}\text{Ti}_{1.7}\text{P}_3\text{O}_{12}$	NASICON
Discs (19.4mm Dia x 1mm Thickness)	$\text{Na}_3\text{Zr}_2\text{Si}_2\text{PO}_{12}$	NASICON

Other Electrolytes

Product	Type
PEO-based Polymer Solid Electrolyte	Polymer
Polymer-Ceramic composite Solid Electrolyte	Polymer-Ceramic
Polymer-Ceramic composite Solid Electrolyte (30 wt.% in Acetonitrile)	Polymer-Ceramic
Polymer-Ceramic composite Solid Electrolyte (30 wt.% in NMP)	Polymer-Ceramic
Solid Electrolyte Dispersion Fluid	n/a



Liquid Electrolytes

LiPF₆ based Standard Electrolyte for Lithium-Ion Batteries 1M LiPF₆ in EC : EMC (3 : 7, by wt.) + 2 wt.% VC

Low Temperature Electrolyte for Lithium-ion Batteries 1M LiPF₆ in EC : DMC : EA (1:1:1, by wt.) + 2 wt.% FEC

Electrolyte for Sodium Batteries 1M NaPF₆ in EC : DEC : PC (1 : 2 : 1, by wt.) + 2 wt.% FEC

Electrolytes for High Energy Batteries 1M LiPF₆ in EC : EMC : FEC (27 : 63 : 10, by wt.) + 2 wt.% VC

High Temperature Electrolytes for Lithium-ion Batteries 1 M LiPF₆ + 0.2M LiTFSI in EC:DEC:PC (50:45:5, by wt.) + 1 wt.% FEC + 3 wt.% VC

Precursor electrolyte powders also available in a range of formulations
- please contact our energy team for more details.

Battery + Supercapacitors:

CASES + CONSUMABLES

We offer a wide range of cases and consumables for battery and supercapacitor research.



Below are our most requested lines, we welcome your enquiry for other specifications

Product	Description
1 Coin Cells	- Coin/Button Cell Cases: CR2032, CR2025, CR2016, CR2450, CR1220, CR2325 - Springs, Spacers, Belleville Washers - Kapton Cells for X-Ray analysis - Meshed Cells for Li-Air research - Gold, Platinum and Aluminium Coated options
2 Cylinder Cells	- Cylinder Cell Cases: 14500, CR123, 18650, 21700, 26650, 32650 - Tabs: Nickel and Aluminium in 3mm, 4mm and 8mm widths - Stainless Steel and Aluminium Cases available
3 Pouch Cells	- Aluminium Laminated Foils – Plane and Pre-formed Cases - Tabs: Nickel and Aluminium in 3mm, 4mm and 8mm widths - Custom Dies for cell forming - Hot Melt Sealing Adhesives in 4mm, 5mm, 8mm and 30mm widths
4 Prismatic Cell Cases	- Aluminium Material Case - Various sizes and capacities available - Tabs and Sealing Plug included
5 Split Test Cells	- Split Test Cells for Coin, Cylinder and Pouch Cells 3-Electrode, Gold coated - Quartz and Beryllium window options for Raman/X-Ray analysis 8-Channel Cell for high throughput testing



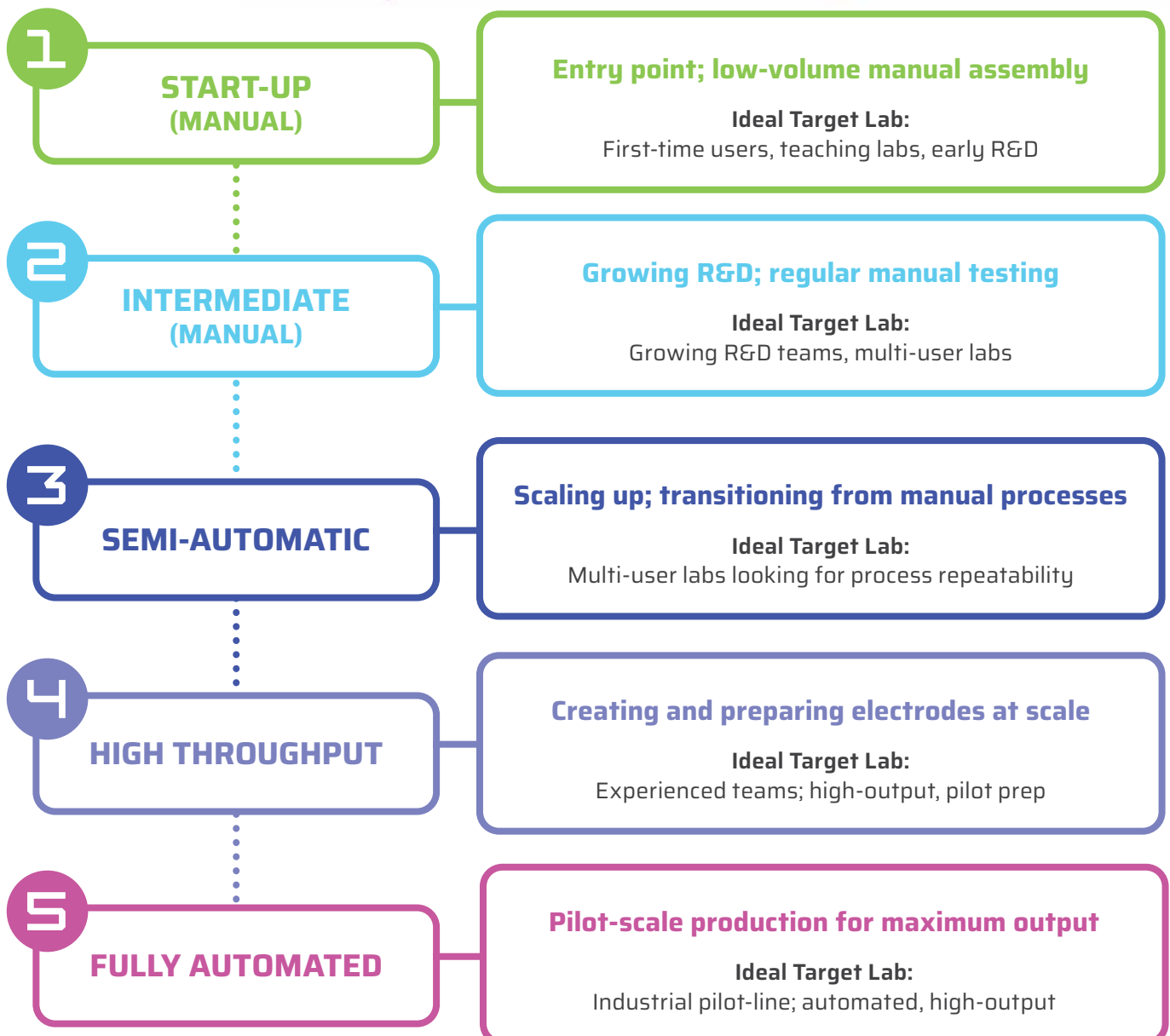
COIN CELL KITS

From first experiment to repeatable results - everything your lab needs in one package

Whether setting up a new lab, training a new team member, or scaling up a development programme, our kits provide the essential equipment, materials and consumables needed for reliable coin cell assembly.

**Pouch
Cell Kits also
available**

Example: 01 START-UP (Manual) kit contents



Battery + Supercapacitors:

LAB-SCALE EQUIPMENT

We provide an extensive choice of equipment for battery and supercapacitor research.

Below is an example of our range, contact our team to discuss your requirements

Product	Description
1 Electrode Coating Preparation	• Tape Casters (Doctor Blade) with Vacuum Chuck; Heated Bed or Cover Heater Options • Roll-to-Roll Coaters • Rolling Presses (Calendars) • Dip Coaters
2 Coin /Button Cell Preparation	• Pneumatic, Hydraulic or Electric Coin Cell Crimping/Disassembling Machines • Dies to fit various cell sizes • Disk Cutters
3 Chemical Preparation/Analysis	• Tube and Vacuum Furnace • Rotary and High Pressure Furnace • Ball Mill and Mixer
4 Battery Testing Systems	• 5V – 50V, 1mA – 30A Battery Analyser with 1-8 Channels and Laptop Controlled
5 Sample Handling and Storage	• Glove Boxes and Vacuum Dry Ovens (1 to 4 chambers) • H₂O and O₂ Purification Systems • Vacuum Dry Ovens 25-360 Litres
6 Pouch Cell Preparation	• Pouch Cell Case Forming • Electrode Cutting/Slitting • Cell Core Stacking or Winding • Current Lead Welding • Vacuum Heat Sealers
7 Cylinder/Prismatic Cell Preparation	• Cylinder Grooving and Crimping • Winding • Tab/Spot Welding • Electrode Slitting



Coin Cell Research Equipment

These are examples only; many other pieces are also available.

	Process	Product
1	Furnace	4" Two Zone Rotary CVD Tube Furnace 1200° Max
2	Milling	High Speed Vibrating Ball Mill with 2 Jars 80ml SS and Nylon
3	Mixing	Compact Dual-Shaft Planetary Vacuum Mixer with one 150 mL container
4	Electrode Coating Preparation	Compact Tape Casting Film Coater with Dryer, Vacuum Chuck and Adjustable Film Applicator
5	Rolling Press (Calendering)	8" Dia. x 10" Width Hot Rolling Press with Dual Micrometer up to 80° with Variable Speed
6	Vacuum Oven	NRTL Certified 53L 200°C Vacuum Oven (16.3x13.6x14.7", 1.9 Cu-Ft) with Digital Temperature Controller
7	Disc Cutting	Precision Disc Cutter with Standard 16, 19, 20mm Dia. Cutting Die and 3-24 mm Dia. Optional Die
8	Glove Box	Glove Box with H ₂ O and O ₂ Purification System and Openable Front Window
9	Coin Cell Assembly	See Coin Cell Consumables
10	Electrolyte Filler	Automatic Digital Bottle Dispenser with one 32 Oz Glass Bottle for 0 - 50 mL Electrolyte
11	Crimping	Compact and Fast Gas Driven Crimper for CR20XX Series Coin Cells, Clean Room and Argon Gas Compatible
12	Testing	8 Channel Battery Analyser (0.002 mA- 1 mA, up to 5V) with Adjustable Cell Holder and Laptop and Software



Battery + Supercapacitors:

PILOT-LINE EQUIPMENT

We provide an extensive range of equipment for battery and supercapacitor pilot-lines.

Below is an example of our range, contact our team to discuss your requirements

Electrode preparation

	Process	Product
1	Planetary Vacuum Mixing	10 Litre Large Planetary Vacuum Mixer with Vacuum Pump and Water Chiller
2	Filtration	Magnetic De-ironing Filtration System 5 Litre for Battery Electrode Slurry
3	Roll to Roll Coating and Drying	Faster Roll to Roll Transfer Coating System 4 Metres per Minute
4	Dual-Filtration for NMP Vapor	Dual-Filtration System for NMP Vapor of Li-ion Battery Coating
5	Rolling Press	Roll to Roll Pressure Controlled Rolling Press
6	Vacuum Drying	150°C Larger Capacity 360 Litres Vacuum Drying Oven with Tri-Level Shelf Heating Modules



Pouch cells

	Process	Product
1	Die Cutting	R2R Automatic Precision Die Cutter for Pouch Cell Electrodes
2	Electrode Stacking	Full Automatic Layer by Layer Stacking Machine for Pouch Cell up to 160L x 100W (mm)
3	Pouch Forming	R2R Automatic Pouch Case Forming Machine for Pilot Scale Pouch Cell Production
4	Pouch Sealing	Automatic Vacuum Sealer Integrated with Electrolyte Injection and Diffusion



Cylinder/Prismatic cells

	Process	Product
1	Electrode Slitting	Roll to Roll Automatic Precision Edge Slitting Machine
2	Roll to Sheet Cutting	Automatic Roll to Sheet Cutting Machine for Cylindrical Battery Electrodes
3	Ultrasonic Welding	Desktop 800 W Ultrasonic Metal Welder Maximum 40 KHz
4	Winding	Automatic Precision Winding Machine 10 PPM Speed
5	Grooving	Floor-stand Automatic Grooving Machine for Batch Processing of Cylindrical Battery Castings
6	Laser Welding	300W Laser Welding System for Prismatic and Cylindrical Cell Cap Sealing
7	Electrolyte Diffusion and Degassing	Electrolyte Diffusion and Degassing Chamber System
8	Cylindrical Cell Crimping	Floor-stand Automatic Cylindrical Cell Crimping Machine



Dry room

A self-assembly walk-in dry room (3m x 3m) which provides a cost effective solution, and holds a range of MTI equipment. It has the equivalent working area to 10 standard sized glove boxes, with a dew point of < -40°C ~ 79 ppm) making it an ideal solution for a Li-ion battery pilot line. Contact us for more details.

Dry room main part



Battery + Supercapacitors:

SAFETY TESTING EQUIPMENT

We provide an extensive choice of equipment for battery and supercapacitor safety testing.

Below is an example of our range, contact our team to discuss your requirements

Lithium-ion Battery Pack Safety Testing Equipment

	Process	Product
1	Altitude Simulation	215L Vacuum Chamber (22"x 25" x 24") with Digital Pressure Control
2	Thermal Test	1000L Programmable Fast Thermal Test Chamber (-70°C – +150°C, UN38.3.4.2)
3	Vibration	Computerized Automatic Vibration Testing System for Max. 15kg Load (UN38.3.4.3)
4	Shock	Automated Pneumatic Shock Tester with Max. Load of 10 Kg (UN 38.3.4.4)
5	External Short Circuit	Short Circuit Testing System with Remote Control up to 1000A for Rechargeable Batteries (UN38.3.4.5)
6	Impact/Crush	Gravity Impact Tester with Remote Control and Free Fall Option for Lithium Battery (UN 38.3.4.6 and IEC 62133)
7	Overcharge	8 Channel Battery Analyser (10A 30V per Channel) with Laptop and Software for All Types of Batteries and Packs - Dual Explosion-Proof Box for Battery Safety Test (20"x20"x20", 125L, UN38.3.4.7 and 8)
8	Thermal Abuse	Thermal Chamber (131L, 200°C Max.) w/ 8 Channel Battery Analyser and Laptop and Software for Battery Thermal Cyclic Test
9	Nail Penetration	2T Max. Hydraulic Driven Crushing and Nail Penetration Tester with Digital and Remote Control

1



2



3



4



5



6



7



8



9



PHOTOVOLTAIC CHEMICALS

We provide an extensive choice of chemicals for photovoltaic research in target, granule and crucible form.

Below are our most requested lines, we welcome your enquiry for other specifications

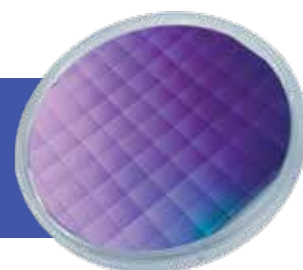
Photoactive Materials & Transparent Conducting Oxides (TCOs)

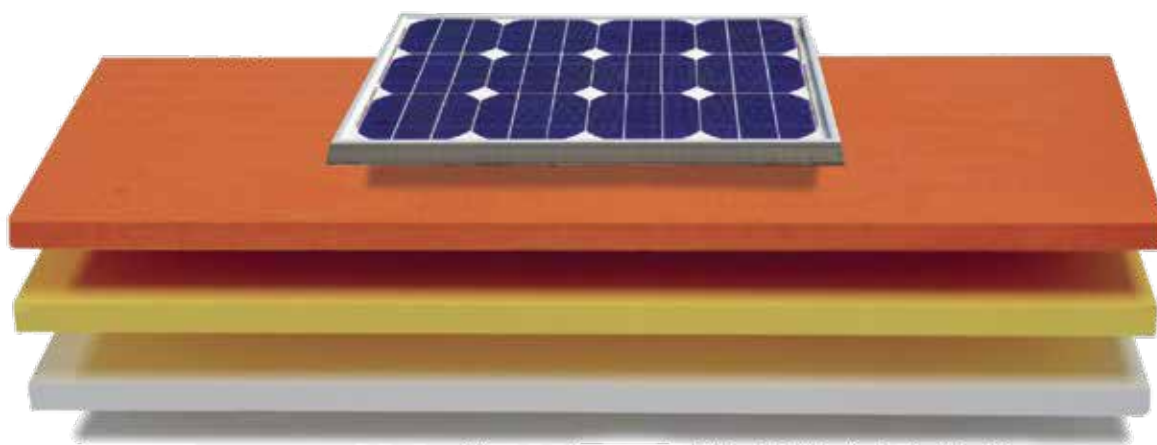
Chemical Name	Formula
OXIDES	
Gallium Zinc Oxide	$\text{Ga}_2\text{O}_3:\text{ZnO}$
Indium Tin Zinc Oxide	$\text{In}_2\text{O}_3:\text{SnO}_2:\text{ZnO}$
Indium Zinc Oxide	$\text{In}_2\text{O}_3:\text{ZnO}$
Indium Gallium Tin Oxide	$\text{In}_2\text{O}_3:\text{Ga}_2\text{O}_3:\text{SnO}_2$
Indium Gallium Zinc Oxide	$\text{In}_2\text{O}_3:\text{Ga}_2\text{O}_3:\text{ZnO}$
Indium Gallium Manganese Oxide	$\text{In}_2\text{O}_3:\text{Ga}_2\text{O}_3:\text{MnO}_3$
Zinc Oxide	ZnO
Zinc Aluminium Oxide	$\text{ZnO}:\text{Al}_2\text{O}_3$
Zinc Tin Oxide	$\text{ZnO}:\text{SnO}_2$
SELENIDES	
Copper Selenide	Cu_2Se
Copper Indium Selenide	CuInSe_2
Copper Indium Gallium Selenide	CuInGaSe
SULPHIDES	
Cadmium Sulphide	CdS
Copper Sulphide	Cu_2S
Copper Indium Sulphide	CuInS_2
Copper Gallium Sulphide	Cu_2GaS_3
TELLURIDES	
Cadmium Telluride	CdTe

Conventional & Custom Selenides, Tellurides and Other Salts

Chemical Name	Formula
ARSENIDES	
Cadmium Arsenide	Cd_3As_2
Gallium Arsenide	GaAs
OXIDES	
Cadmium Oxide	CdO
Cadmium Oxide/Tin Oxide	CdO/SnO_2
Cadmium Tungsten Oxide	CdWO_4
PHOSPHIDES	
Indium Phosphide	InP
SELENIDES	
Cadmium Selenide	CdSe
Copper Indium Gallium Selenide	$\text{CuInGaSe}_2/\text{CuIn}_{0.7}\text{Ga}_{0.3}\text{Se}_2$ (CIGS)
Copper Indium Selenide	CuInSe_2 (CIS)
Copper Zinc Tin Selenide	CuZnSnSe
STANNATES	
Cadmium Stannate	Cd_2SnO_4
SULPHIDES	
Copper Zinc Tin Sulphide	CuZnSnS
Cadmium Sulphide	CdS
TELLURIDES	
Cadmium Telluride	CdTe
Cadmium Zinc Telluride	CdZnTe (CZT)

You may be interested in... **Wafers**
(including Silicon, Glass, and Semi-Conductor) on pages 24-25





Alloy Targets

Chemical Name	Formula
Indium Tin	In_xSn_y
Indium Antimony	In_xSb_y
Zinc Aluminium	Zn_xAl_y

Evaporation Granules

Chemical Name	Formula
Copper Germanium	CuGe
Copper Germanium Selenium	CuGeSe

Standard Metals & Non-Metals

Standard base metals and non-metals available upon request

Laboratory Equipment

Product	Description
1 Spin Coaters	7", 8", 12" and 15" Bowl Diameters - Manual and programmable options - Manual, Semi-Automatic, Automatic and Multi dispenser options - Standard sizes and custom chuck designs - Additions: Vacuum Pumps - Oiled or Oil-Free, Air Compressors and Hot Plates (50-350°C) up to 150mm Diameter
2 Dip Coaters	- Up to 20 inch x 20 inch - Manual and programmable options
3 Ovens and Hot Plates	- Vacuum and Forced Air Convection models, available in desktop and free standing options up to 500°C - Digital Controlled Hot Plates, available with stirrer options and sample mounting plates



PEROVSKITE SOLAR CELL MATERIALS

We provide access to a comprehensive range of materials for perovskite solar cell development and manufacturing, supporting a variety of deposition and fabrication methods.

Custom stoichiometry, doping levels, and particle sizes are available to meet your specific requirements.



Below are our most requested lines, we welcome your enquiry for other specifications

Forms

HIGH-PURITY
POWDERS

SPUTTERING
TARGETS

EVAPORATION
PELLETS

READY-TO-USE
SOLUTIONS

Light-Absorbing Active Layer (Perovskite Absorbers)

Examples

BaZrS₃, Cs₂AgBiBr₆, CsPbBr₃, FAPbI₃, MAPbI₃

Electron Transport Layer (ETL)

Examples

BiFeTiO₃, PC₇₁BM, SnO₂, TiO₂, WO₃

Hole Transport Layer (HTL)

Examples

CuSCN, CuI, Cu₂O, Spiro-OMeTAD, V₂O₅

Perovskite Precursors & Halide Salts

Examples

CsBr, PbBr₂, PbI₂, PbCl₂, Pb(SCN)₂, MACl

Counter Electrodes & Transparent Contacts

Examples

Ag, Au, Carbon Black, Cr, Mo, Pt

Passivation & Interface Materials

Examples

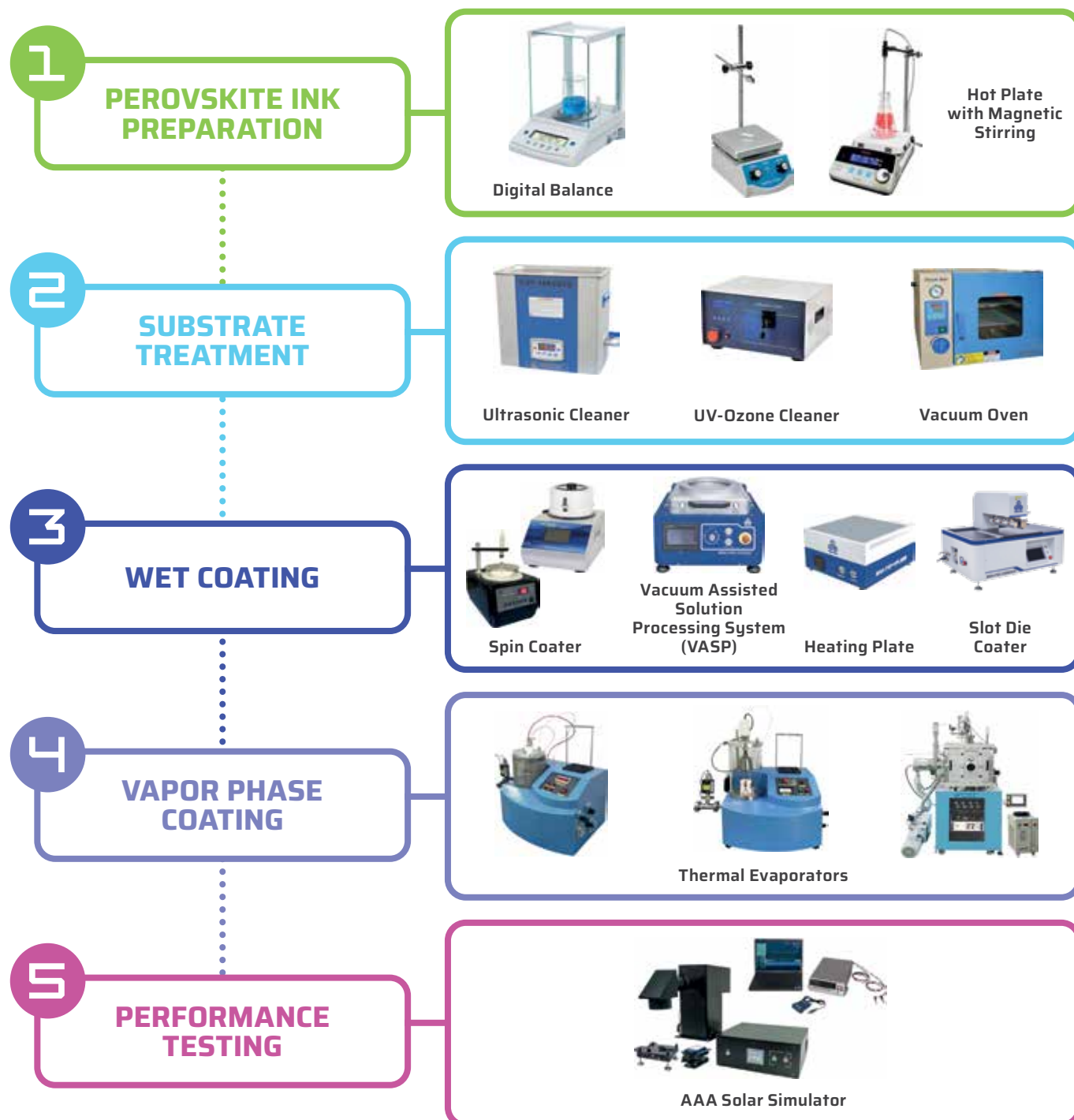
Cs₂CO₃, KI, KF, LiF, NaF, ZnO

PEROVSKITE SOLAR CELL EQUIPMENT

We provide an extensive choice of equipment for you to create a complete perovskite research workflow, from ink preparation to cell analysis. Visit our website for individual product specifications.

Below is an example of our range, contact our team to discuss your requirements

Perovskite Solar Cell Research Workflow





SILICON WAFERS



We offer a wide range of silicon wafers, produced to exact customer requirements or as standard wafer specifications available from stock.

Below are our most requested lines, we welcome your enquiry for other specifications

Grades (choose from the following)

Prime

HIGH, DEVICE QUALITY

Test

MEDIUM

Reclaim

MEDIUM TO LOW

Mechanical

LOW

Diameter and Thickness

Size	Standard Thickness (µm)	Tolerance (+/- µm)
1" (25.4mm)	250	15
2" (50.8mm)	275	25
3" (76.2mm)	380	25
4" (100mm)	525	20
6" (150mm)	675	25
8" (200mm)	725	20
12" (300mm)	775	25

Ultra Thin and Ultra Thick wafers available; thicknesses from 30 µm up to 20mm.

Custom thicknesses available on request.

NEW

Type and Dopant

Type	Dopant
Intrinsic	-
n-type	P- Phosphorous, Sb - Antimony, As - Arsenic
p-type	B - Boron

Heavy P or B doping is also available

Orientation

Orientation	Tolerance
<100>	
<110>	Standard +/- 0.5° and Custom up to +/- 0.05°
<111>	

Custom Orientations and Off Orientations (up to 40°) available on request

Resistivity

Crystal Growth Method	from	to
Czochralski (CZ)	1 milliohm-cm	150 ohm-cm
Float Zone (FZ)	-	Up to 10,000 ohm-cm

Surface

As cut

Lapped

Etched

Single side polished

Double side polished

On polished surface: Roughness <2Å/Total Thickness Variation (TTV) <1µm. Laser marking available on request.

Silicon as a substrate

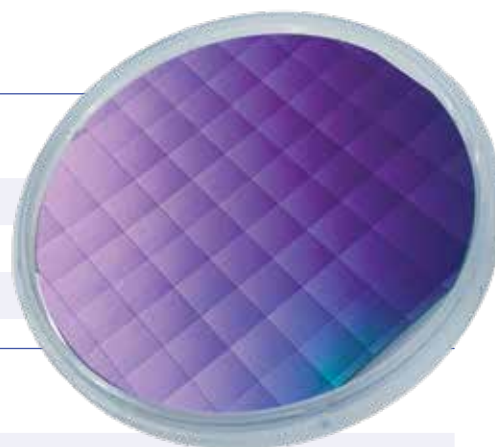
Type	Specifications
Windows	As per customer drawings
Components	As per customer drawings
Blocks	To customer specification including surface roughness and flatness

We can also supply Germanium single crystal components

Specialised Wafers

Platinised Wafers

	Specifications
Diameter	4" Standard or other sizes available upon request
Layers	Thermal SiO ₂ , TiO ₂ or Ti Adhesion, Platinum E-Beam



Silicon on Insulator (SOI) Wafers

	Specifications
Size	As per customer specification
Layers	Handle, Device, Buried Oxide (BOX) – All layers as per customer specification

Pocket Wafers

Pocket wafers enable smaller substrates or wafers to be securely processed on larger wafer handling equipment, helping maximise the use of existing systems while maintaining precise positioning and process compatibility. Available in a range of materials and custom configurations.

SERVICES

Coatings

Type	Method	Thickness (nm)	Diameter
SiO2 Silicon Dioxide	Wet Oxidation	200-3000	From 1" to 6"
	High Purity Dry Oxidation	20-300	
Single face oxidation also available			
Si3N4 Silicon Nitride	LPCVD or PECVD	20-500	From 2" to 6"
Metal Coatings including Cr, Ti, Au, Al, Pt, Mo, W, Ni, Cu, Ir, Ta	PVD Sputtering or Evaporation	20-1000	From 1" to 6" (depending on metals)
Other metal coatings and multi-layer deposition available on request			

Dicing Services

Form	Specifications
Tiles	E.g. 10mm x 10mm, 20mm x 20mm (minimum size 1.5mm x 1.5mm)

OTHER WAFERS

We provide an extensive choice of wafers for applications including sensors, high temperature, high power and optical devices.



Below are our most requested lines, we welcome your enquiry for other specifications

Glass Wafers

The following specifications of Borofloat glass wafers are all available from stock for immediate despatch. We also offer wafers and tiles to custom specifications, including diameter, thickness and polish.

Material	Product	Description	Sizes
Borofloat BF33 Glass	2" (50.8mm)	0.5mm $\pm$ 0.025mm	Double Sided Polished
Borofloat BF33 Glass	3" (76.2mm)	0.5mm $\pm$ 0.025mm	Double Sided Polished
Borofloat BF33 Glass	4" (100mm)	0.5mm $\pm$ 0.025mm	Double Sided Polished

Semiconductor Wafers

Available in sizes up to 12"

III-V Wafers

Name	Formula
Gallium Arsenide	GaAs
Gallium Phosphide	GaP
Indium Phosphide	InP
Indium Antimonide	InSb
Indium Arsenide	InAs

II-VI Wafers

Name	Formula
Zinc Telluride	ZnTe
Zinc Selenide	ZnSe
Cadmium Sulphide	CdS
Cadmium Telluride	CdTe
Cadmium Telluride doped with Zinc	Cd-Zn-Te

Silicon Carbide Wafers

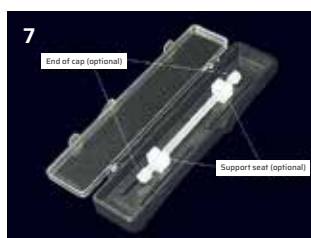
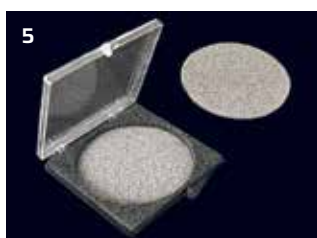
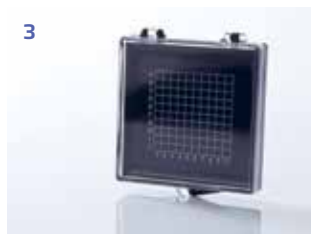
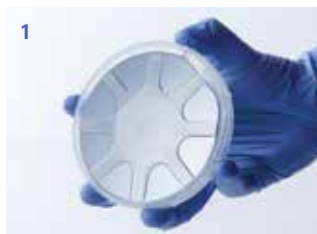
The use of Silicon Carbide (SiC) in the semiconductor industry has expanded due to its advantageous physical properties, including its hardness, high thermal conductivity and low coefficient of thermal expansion.

At PI-KEM we offer a range of Silicon Carbide (SiC) wafers in a number of polytypes including 4H, 6H AND 3C SiC in a range of wafer diameters. Please contact us for further information.

SUBSTRATE + WAFER STORAGE

We offer a wide range of substrate and wafer storage.

	Product	Description	Sizes
1	Individual Wafer Carriers	Each carrier consists of base, lid and retainer spring. Base has concave profile so that only the extreme edge of the wafer is in contact with the carrier.	1", 2", 3", 4" and 6"
2	Multi Wafer Storage Boxes	Each box can hold up to 25 wafers. Lid and box have moulded supports so minimal contact is made with the wafer whilst keeping each wafer secure.	2", 3" and 4"
3	Gel-Sticky Boxes	Designed to protect delicate components by a sticky carrier gel layer. Components or devices are held securely on surface once in contact with the gel layer. The components can be taken off by tweezers or by hand.	2", 3" and 4"
4	Membrane Boxes	High-elastic film designed for packing fragile components with irregular shape or rods. The component is pressed tightly by two layers of high-elastic film and suspended in the middle of the carrier, preventing fragile components from damage. Can be used for various optoelectronic components.	1", 2", 3", 4" and 5"
5	Plastic Foam Module Boxes	This packing is designed to protect delicate parts. Used in many fields like optical materials, optoelectronic components, semiconductor, and optical communication. Consists of three cushions, the middle cushion can be customised to a specific shape.	3" and 4" single or multiple wafers
6	Die/IC Trays	This system provides a safe and convenient packing and delivery solution for bare die, CSP, optoelectronics and other microelectronic devices. Trays, lids and clamps for single and multiple layers available.	9-1600 pockets
7	Smart Carrying Box for Rods	Innovative packing box designed for protecting and carrying laser rods or devices of rod shape. Two silicone support seats in the base of the box hold the rods.	Diameter from 3-8mm and up to 160mm (L)
8	Metal Flex Wafer Frames & Carriers	Secure handling and storage for semiconductor wafers. Precision metal flex frames and robust wafer shippers designed to safely transport and protect up to 13 mounted flex frames.	For up to 12" wafers Single or multiple wafers



SOLID OXIDE FUEL CELL TECHNOLOGY

We offer a wide range of materials for solid oxide fuel cells.

Below are our most requested lines, we welcome your enquiry for other specifications

Anode Powders

Chemical	Standard weight %
NiO/YSZ	50 wt% NiO/50 wt% (8 mol% YSZ) 60 wt% NiO/40 wt% (8 mol% YSZ) 70 wt% NiO/30 wt% (8 mol% YSZ) - Custom NiO/YSZ
NiO/CGO	50 wt% NiO/50 wt% Ce_{0.8}Gd_{0.2} Oxide 60 wt% NiO/40 wt% Ce_{0.8}Gd_{0.2} Oxide 70 wt% NiO/30 wt% Ce_{0.8}Gd_{0.2} Oxide - Custom NiO/CGO

Cathode Powders

Chemical	Standard weight %
La/Ca/Mn Oxide	- La_{0.8}Ca_{0.2}Mn Oxide (La_{0.8}Ca_{0.2})_{0.98}Mn Oxide - Custom La/Ca/Mn Oxide
La/Co Oxide	Custom La/Co Oxide
La/Sr/Fe Oxide	- La_{0.8}Sr_{0.2}Fe Oxide - Custom La/Sr/Fe Oxide
La/Sr/Fe/Co Oxide	- La_{0.6}Sr_{0.4}Fe_{0.2}Co_{0.8} Oxide - La_{0.6}Sr_{0.4}Fe_{0.8}Co_{0.2} Oxide - La_{0.8}Sr_{0.2}Fe_{0.8}Co_{0.2} Oxide - Custom La/Sr/Fe/Co Oxide
La/Sr/Mn Oxide	- La_{0.5}Sr_{0.5}Mn Oxide - La_{0.6}Sr_{0.4}Mn Oxide - La_{0.7}Sr_{0.3}Mn Oxide - La_{0.8}Sr_{0.2}Mn Oxide (La_{0.8}Sr_{0.2})_{0.98}Mn Oxide - La_{0.8}5Sr_{0.15}Mn Oxide (La_{0.8}5Sr_{0.15})_{0.98}Mn Oxide - La_{0.9}Sr_{0.1}Mn Oxide - Custom La/Sr/Mn Oxide

Interconnect Powders

Chemical	Standard weight %
La/Ca/Cr Oxide	- La_{0.7}Ca_{0.3}Cr Oxide - La_{0.8}Ca_{0.2}Cr Oxide - Custom La/Ca/Cr Oxide
La/Sr/Cr Oxide	- La_{0.7}Sr_{0.3}Cr Oxide - La_{0.8}Sr_{0.2}Cr Oxide - Custom La/Sr/Cr Oxide

Electrolytes

Chemical	Standard weight %
Ce/Gd Oxide	- Ce_{0.8}Gd_{0.2} Oxide - Ce_{0.9}Gd_{0.1} Oxide - Custom Ce/Gd Oxide
Ce/Sm Oxide	- Ce_{0.8}Sm_{0.2} Oxide - Custom Ce/Sm Oxide
Ce/Y Oxide	- Ce_{0.8}Y_{0.2} Oxide - Custom Ce/Y Oxide
La/Sr/Ga/Mg Oxide	- La_{0.8}Sr_{0.2}Ga_{0.8}Mg_{0.2} Oxide - La_{0.9}Sr_{0.1}Ga_{0.8}Mg_{0.2} Oxide - Custom La/Sr/Ga/Mg Oxide
ScSZr Oxide	10 mol% Sc₂O₃/90 mol% ZrO₂ - Custom ScSZr Oxide
YSZ Oxide	8 mol% Y₂O₃/92 mol% ZrO₂ 10 mol% Y₂O₃/90 mol% ZrO₂ - Custom YSZ

Protonic conductors

Chemical
Custom Ba/Ce/Y Oxide
Custom Ba/Zr/Y Oxide

CERAMIC PARTS + COMPONENTS

We offer a wide range of ceramic parts and components in both standard forms and custom manufactured to your drawings.

Alumina Plates



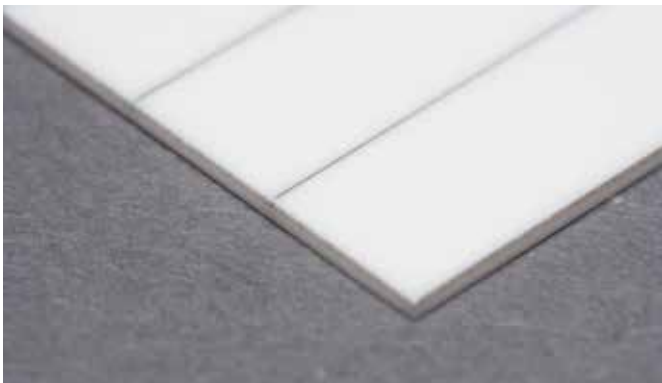
Alumina Rods & Tubes



Alumina Laser Cuts & Custom



3YSZ - Sheets



3YSZ is a special partially stabilized zirconia which is used for thin film applications. Among others, it can be used as an ion conductive ceramic membrane for Solid Oxide Fuel Cells (SOFC). This material is characterised by its excellent flexibility, extremely high bending strength and high fracture toughness. Another advantage is that this material can be manufactured in small thicknesses.

Typical characteristics	Value/Unit
Colour	White
Density	6.03 g/cm ³
Surface Roughness R _a	<0.1 µm
Bending Strength	>1.000 MPa
Thermal Expansion Coefficient	~10 10 ⁻⁶ K ⁻¹
Thermal Conductivity	2 W/mK
Standard Dimension	101.6 x 101.6mm
Thickness	0.15mm
Structure	Dense
Mains Components	95% ZrO ₂ + 5% Y ₂ O ₃
Dielectric Strength at 20°C	>10 kV/mm

HIGH TEMP CERAMIC ADHESIVES, COATINGS + SEALANTS

We supply a large selection of high temperature ceramic adhesives, coatings and sealants in partnership with Aremco. Designed for performing in extreme environments or for applications requiring high performance and reliability.

High Temperature Ceramic & Graphite Adhesives

Specialist formulations for bonding, potting and sealing ceramics, composites, graphite, metals, quartz and semiconductors - up to 3200°F (1760°C)



High Temperature Coatings for Ceramics, Glass & Quartz

Ceramic-Inorganic

Single-part, waterborne, phosphate-bonded coating temps up to 2000°F (1093°C). Multiple colours available.

Glass

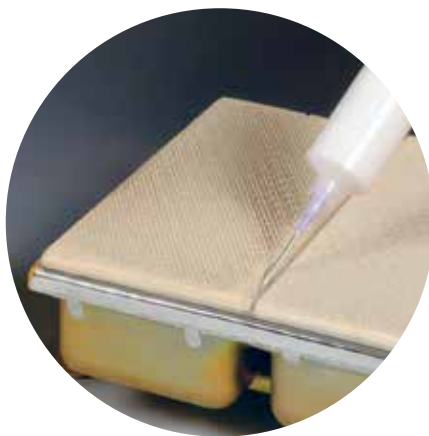
- Glass-filled adhesive/sealer for porous ceramics and refractories up to 816°C
- White reflective glass-ceramic coating for glass and quartz up to 816°C



High Temperature Thermal Spray Sealants

- Aluminium phosphate, single-part - ultra-fine thermal spray up to 3000°F (1650°C)
- Alumina-filled, phosphate-bonded sealer - abrasion and corrosion resistant up to 3000°F (1650°C)
- Urethane-based, gloss black sealer - room temperature curing, temps up to 400°F (204°C)
- Novolac-epoxy, two-part - exceptional abrasion/corrosion resistance up to 300°F (150°C) continuous; 400°F (204°C) intermittent
- Silicone-based, aluminium-filled - heat-curable, exceptional moisture resistance up to 1100°F (593°C)





High Temperature Electrical Coatings & Sealants

Ceramic-Inorganic

- Insulation paste for circuit breakers, power resistors and solenoids up to 1316°C
- Insulation coating for high-power resistors and rheostats up to 1316°C

Silicone

- Transparent sealer — exceptional electrical and moisture resistance to 427°C. Specialised viscosities available.

Silicone-ceramic

- Translucent, low-viscosity sealer for porous materials up to 482°C
- Electrical insulation coating for temps up to 593°C

Silicone-Glass

- Grey, scratch-resistant coating for up to 482°C, or up to 760°C

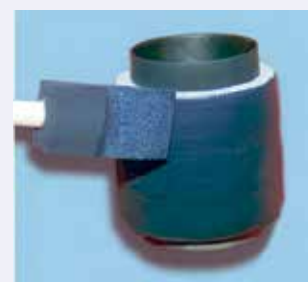
Glass

- Black glass-enamel coating for stainless steel to 538°C



High Temperature High Emissivity Coatings

HiE-Coat™ 840-Series black-body formulations — significantly improves thermal efficiency of infrared heaters, furnaces, incinerators and ovens



Ultra High Temperature Ceramic Coatings

Corr-Paint™ CP3015-xx series — silicate-bonded, ceramic/metal-filled, aqueous-based coatings with excellent thermal shock, oxidation and chemical corrosion resistance for temps up to 1500°F (816°C). Standard and custom colours available.





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