

GRAPHITE & CARBON BASED SOLUTIONS FOR MOBILE ENERGY

TIMREX®
Graphite

C-ENERGY™
Graphite &
Carbon Black

ENSACO®
Carbon Black



IMERYS

ADVANCED KNOWLEDGE AND EXPERTISE – FOR HIGH QUALITY, HIGH PERFORMING SOLUTIONS

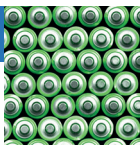


INSPIRED BY THE FUTURE

Inspired by future technologies and combined with the strength of over a century of experience in the development of specialty carbon additives for the most advanced applications, Imerys Graphite & Carbon markets high quality solutions for a wide range of needs.

All of our solutions are developed in close partnership with our customers representing diverse markets. Our particular expertise in the mobile energy market covers lithium-ion batteries, fuel cells, alkaline batteries and lead acid batteries.

A global presence and extensive networks, state-of-the-art laboratories, scientists and technical experts support the continuous development of consistent, high quality products suitable for the most sophisticated applications.



SPECIALTY CARBONS FOR LITHIUM-ION BATTERIES

GLOBAL LEADER

Imerys Graphite & Carbon is the global leader in conductive additives for lithium-ion batteries.

Our **C-ENERGY™** line of extremely high purity graphites and conductive carbon black powders are used as conductive additives in the positive and negative electrodes of lithium-ion batteries.

The benefits of our products include:

- ✓ Increased energy and power density
- ✓ Cost reduction and operational efficiency
- ✓ Improved battery safety

Our **C-ENERGY™ GHDR** grades for the active mass of the negative electrode are made with our proprietary chemical vapor deposition coating – an environmentally friendly alternative to pitch coating. In addition, we have just introduced a new line of additives for the active mass. Adding a small percent of our **QX Quick Charge** line to your active mass will significantly improve your battery's charge and cycling rate, especially at low temperatures. Finally, our **carbon-based dispersions** are an ideal coating for the aluminium current collector.

Together with our premium range of products, Imerys Graphite & Carbon offers a chemical vapor deposition (CVD) coating service. In particular, the expected benefits for the anode materials for Lithium-ion batteries are:

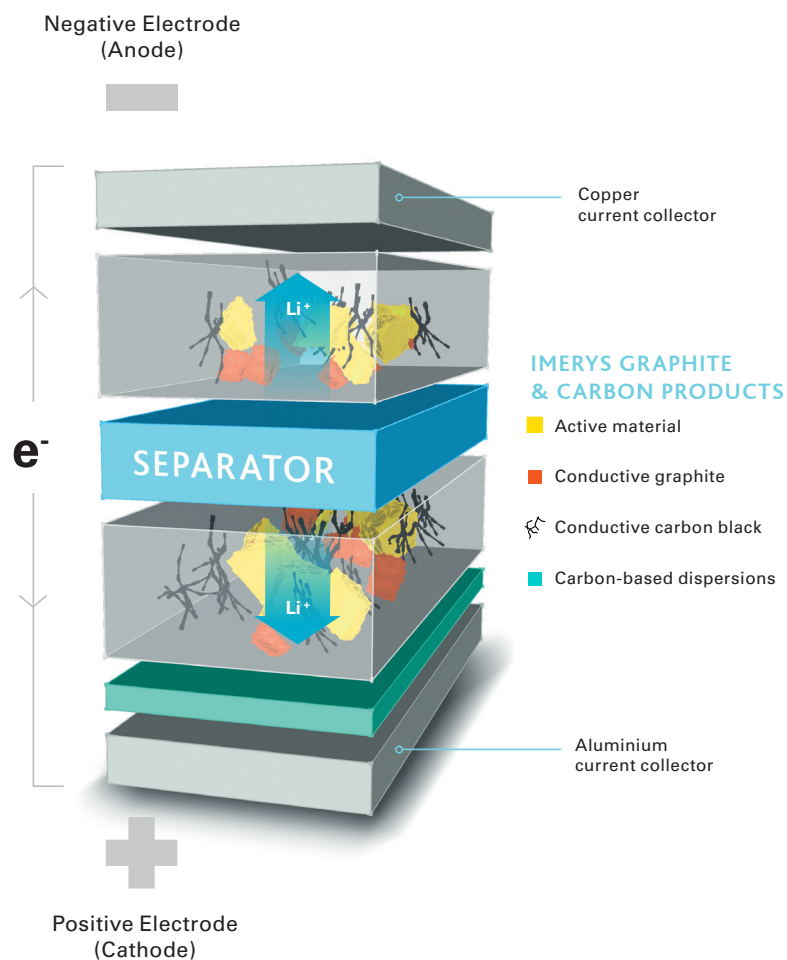
- ✓ Low resistance
- ✓ Lower temperature performance improvement
- ✓ High capacity
- ✓ High efficiency
- ✓ Improved safety
- ✓ A more sustainable impact compared to other technologies



LITHIUM-ION BATTERY
BUSINESS IS AT THE
CORE OF OUR STRATEGY

WE ARE THE ONLY
SUPPLIER ABLE TO OFFER
BOTH CONDUCTIVE
CARBON BLACK
& GRAPHITE

LITHIUM-ION CELL (LI-ION)



COMPONENT	OUR PRODUCTS	VALUE
ANODE / CATHODE	Graphite Conductive Additives: ✓ C-ENERGY™ L-Series, SFG6L, SFG15L, KS6L, KS15L	✓ Very high purity ✓ Increased safety ✓ Very high electrical conductivity and reversible capacity ✓ High density and low spring back ✓ Very efficient electrolyte wettability
ANODE / CATHODE	Carbon Black Conductive Additives: ✓ SUPER P Li ✓ C-ENERGY™ SUPER C65, SUPER C65T, SUPER C45	✓ High structure and low surface area guaranteeing exceptional distribution in electrode slurries ✓ Low moisture pick up ✓ Highly graphitic ensuring excellent system stability ✓ Reduction in OCV (open circuit voltage), which reduces rejection rate and improves safety
ANODE	Graphite Active Additives: ✓ QX line Quick Charge	✓ Improved charge rate performance at room temperature ✓ Improved charge rate performance at low temperature ✓ Improved high rate cycling, especially at low temperature ✓ Improved charge performance and low temperature performance of most anode materials ✓ Improved performance of active materials that are already supposed to deliver high charge rate performance
ANODE	Graphite Active Materials: ✓ C-ENERGY™ GHDR 15-4, GHDR 10-4	✓ High reversible capacity ✓ Excellent low temperature performance

SPECIALTY CARBONS FOR FUEL CELLS

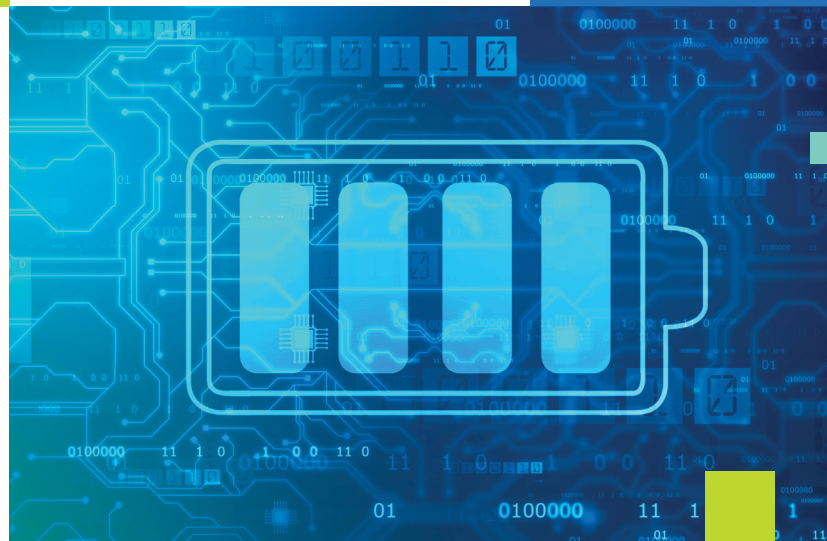
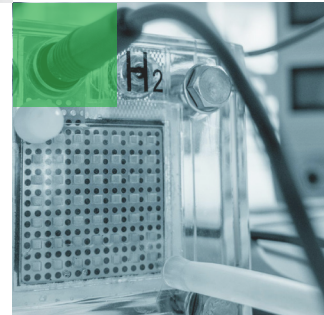
COMPLETE PORTFOLIO

Imerys Graphite & Carbon has a complete portfolio of carbon materials essential for the manufacture of fuel cells.

Our **ENSACO®** and **C-ENERGY™** conductive carbon black with optimized specific surface area and pore structure provide excellent catalyst support, ensuring low corrosion and good catalyst activity.

C-ENERGY™ carbon powders and **C-SPERSE™** aqueous dispersions have a strong impact on hydrophobicity and porosity, which allows to fine tune gas and water transport in the gas diffusion and microporous layers of fuel cells.

Finally, our **TIMREX®** graphites and **ENSACO®** carbon black can be used as additives to provide electrical and thermal conductivity to plastic/resin molded bipolar plates without compromising mechanical stability.

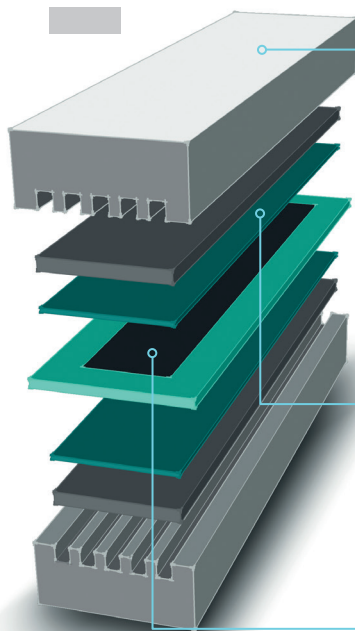


FUEL CELL BUSINESS
IS A PILLAR OF OUR
GLOBAL STRATEGY

WE ARE THE ONLY
SUPPLIER ABLE TO OFFER
BOTH CONDUCTIVE
CARBON BLACK
& GRAPHITE

PEM FUEL CELL

Negative Electrode
(Anode)



Positive Electrode
(Cathode)

COMPONENT	OUR PRODUCTS	VALUE
BIPOLAR PLATES	<p>Graphite and Carbon Black Conductive Additives:</p> <ul style="list-style-type: none"> ✓ TIMREX® KS (KS150, KS75, KS5-75TT) ✓ TIMREX® SFG (SFG150, SFG75) ✓ ENSACO® 250G, 260G ✓ TIMREX® C-THERM™ 	<ul style="list-style-type: none"> ✓ Electrical conductivity ✓ Thermal conductivity ✓ Mechanical stability ✓ Processability ✓ Low gas permeability ✓ High corrosion resistance
GAS DIFFUSION LAYER	<p>Conductive Additives:</p> <ul style="list-style-type: none"> ✓ C-SPERSE™ Water Based Carbon Dispersions ✓ C-ENERGY™ Graphite (KS6L) and Carbon Black Powders 	<ul style="list-style-type: none"> ✓ Control of porosity and hydrophilicity for optimized transport of gases and liquids ✓ Electrical and thermal conductivity
CATALYST SUPPORT	<p>Carbon Black Support for Catalyst:</p> <ul style="list-style-type: none"> ✓ ENSACO® 350G ✓ C-ENERGY™ Carbon Black 	<ul style="list-style-type: none"> ✓ Optimized specific surface area and pore structure for low corrosion and good catalyst activity, enabling reduced precious catalyst dosage ✓ Optimized pore structure for transport of gases and liquids ✓ Can be burned off to recycle the precious catalyst at end of life

SPECIALTY CARBONS FOR ALKALINE BATTERIES

SUPPLIER OF CHOICE

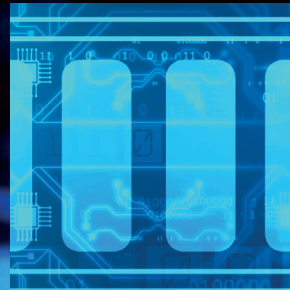
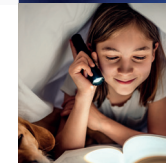
Imerys Graphite & Carbon is the graphite supplier of choice for alkaline battery manufacturers.

Our **TIMREX®** line is a complete offer of natural, synthetic and expanded graphite powders. Used in the cathode mass, our highly crystalline and high purity graphite powders ensure electrical conductivity, while reducing gassing, increasing mechanical stability and processability of the cathode ring.

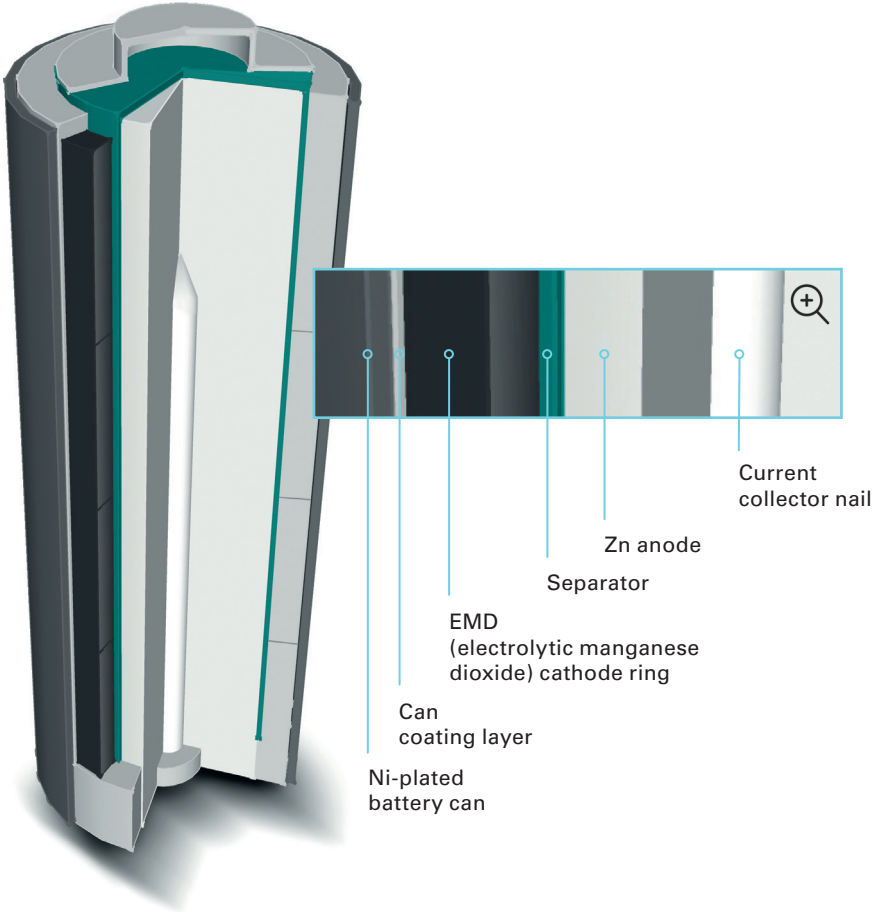
In addition, our **TIMREX®** aqueous graphite dispersions for can coatings further increase electrical conductivity while improving resistance to corrosion.

Benefits of our solutions for improved electrical conductivity include:

- ✓ High performance to price ratio
- ✓ Cost and operational efficiency due to excellent processability and self-lubrication of graphite which minimizes tool wear
- ✓ Improved safety
- ✓ Environmentally friendly solutions



ALKALINE BATTERIES



COMPONENT	OUR PRODUCTS	VALUE
EMD CATHODE RING	Graphite Conductive Additives: ✔ TIMREX® KS	✔ Good electrical conductivity ✔ Optimal electrolyte penetration in the electrode ✔ Ideal ionic contact of the EMD particles ✔ Good processability
	✔ TIMREX® MB, MK, MX & KC	✔ High electrical conductivity ✔ Designed to allow a high EMD/graphite ratio in order to optimize energy and power density of the battery ✔ Excellent processability ✔ High performance to price ratio
	✔ TIMREX® BNB90	✔ Excellent electrical conductivity with very low percolation thresholds ✔ High mechanical stability ✔ High energy density ✔ High current drain
CAN COATING	Graphite Dispersion: ✔ TIMREX® LB Aqueous Dispersions	✔ Environmental friendly ✔ Improved electrical conductivity ✔ Improved discharge capacity

SPECIALTY CARBONS FOR ADVANCED LEAD ACID BATTERIES

A DIVERSE OFFERING

Imerys Graphite & Carbon provides to advanced lead acid batteries manufacturers a diversified offer of specialty carbon solutions to meet a wide range of needs.

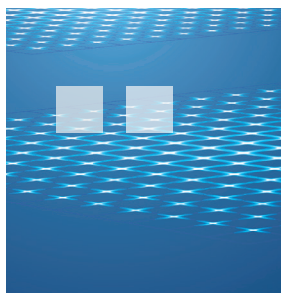
Our product range for this application is made of high purity expanded graphite **TIMREX® BNB90** and **TIMREX® CyPbrid™ 4**.

In addition to this **TIMREX® CyPbrid™ 1, 2 and 3** are hybrid carbon solutions which combine the relevant properties of graphite and carbon black in a unique product.

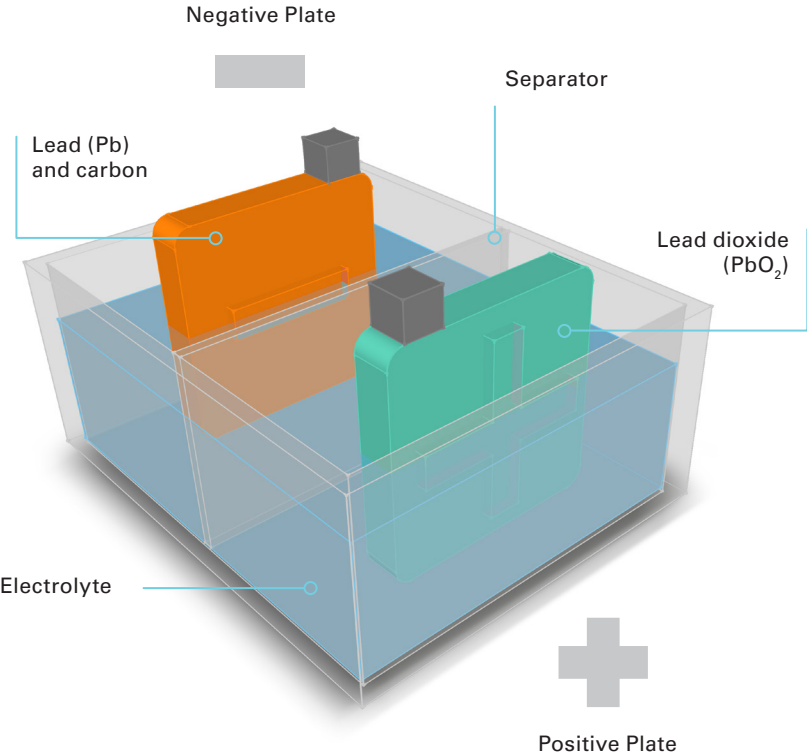
The carbon black additive **SUPER P®** completes our offer as a high-purity and highly conductive carbon black with a moderate surface area.

Benefits of our solutions include:

- ✓ Improving Charge Acceptance
- ✓ Improving depolarisation negative plate in Advance Lead Acid Batteries



ADVANCED LEAD ACID BATTERIES



COMPONENT	OUR PRODUCTS	VALUE
NEGATIVE PLATE	Graphite Conductive Additives: <ul style="list-style-type: none">✓ TIMREX® BNB90✓ TIMREX® CyPbrid™ 4	<ul style="list-style-type: none">✓ Good wettability for paste processing and electrolyte supply to the negative plate✓ High affinity to lead for an efficient lead plating on the negative active mass (NAM) skeleton✓ Good electrical conductivity to reduce cell resistivity✓ Improved cycle life
	Hybrid Carbon Additive: <ul style="list-style-type: none">✓ TIMREX® CyPbrid™ 1, 2 & 3	<ul style="list-style-type: none">✓ Good wettability for paste processing and electrolyte supply to the negative plate✓ High affinity to lead for an efficient lead plating on the negative active mass (NAM) skeleton✓ Good electrical conductivity to reduce cell resistivity✓ High BET specific surface area (SSA) for better dynamic charge acceptance (capacitor effect)✓ Improved cycle life
	Carbon Black Conductive Additives: <ul style="list-style-type: none">✓ SUPER P®	<ul style="list-style-type: none">✓ High purity to reduce gassing and self-discharge✓ Improved charge acceptance

IMERYS GRAPHITE & CARBON – A STRONG, INNOVATIVE COMPANY.



With production sites in Europe, Canada and Japan and sales offices in Europe, America and throughout Asia we can ensure security of supply and an optimal customer experience.

OUR EXPERTISE

Imerys Graphite & Carbon is a global company focused on delivering carbon based solutions for manufacturing and industry.

We have over 100 years of experience in the development and production of a wide variety of high quality synthetic and natural graphite powders, conductive carbon blacks, silicon carbide and water based dispersions for various end applications including, but not limited to:

- ✓ [Lithium-ion Batteries](#)
- ✓ [Alkaline Batteries](#)
- ✓ [Lead Acid Batteries](#)
- ✓ [Fuel Cells](#)
- ✓ [Conductive Polymers, Plastics and Rubbers](#)
- ✓ [Carbon Brushes](#)
- ✓ [Brake Pads and Clutches](#)
- ✓ [Powder Metallurgy and Hard Metals](#)
- ✓ [Refractories](#)

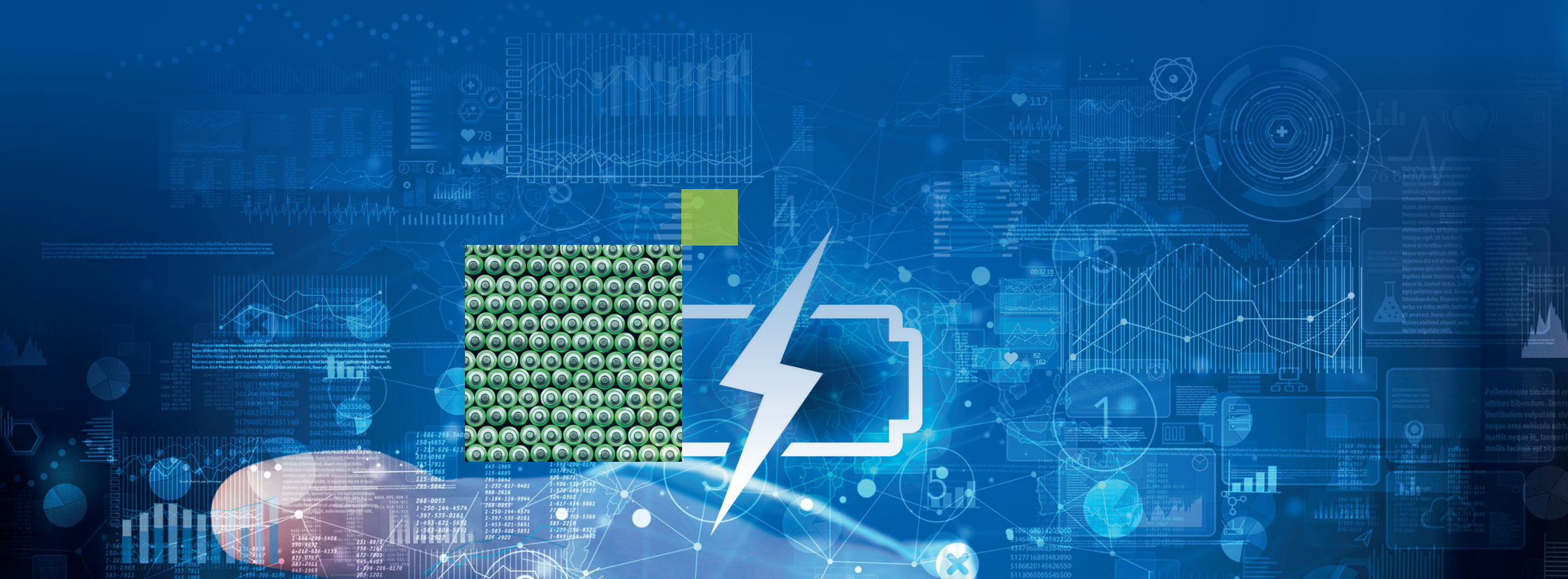
Our team of over 500 experienced professionals ensures we deliver optimal solutions for the technical challenges faced by our customers making us the market leader for:

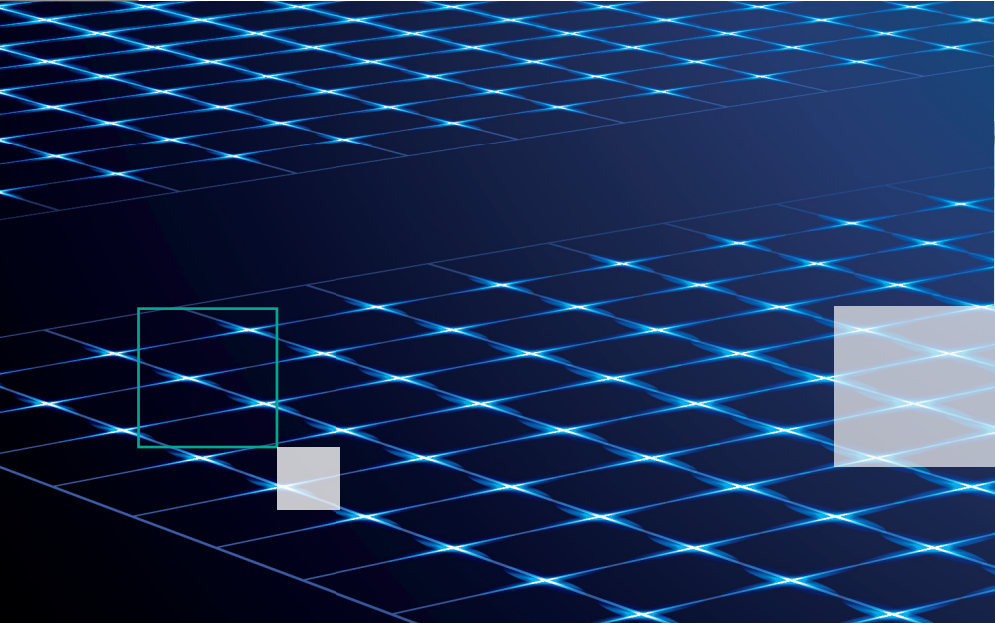
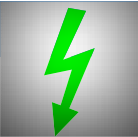
- ✓ [Conductive carbon blacks and graphites for lithium-ion batteries](#)
- ✓ [Graphites for alkaline batteries](#)
- ✓ [Graphites for resin bonded carbon brushes](#)
- ✓ [Conductive carbon blacks for conductive polymers](#)

IMERYS GROUP

Imerys Graphite & Carbon belongs to Imerys Group, the world leading supplier in mineral based specialties for industry.

The Group draws on its understanding of applications, technological knowledge and expertise in material science to deliver solutions based on beneficiation of its mineral resources, synthetic minerals and formulations. These contribute essential properties to customers' products and their performance, including heat resistance, hardness, conductivity, opacity, durability, purity, lightness, filtration, absorption and water repellency.





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