

Conductive Carbon Blacks for Energy Storage Systems

Industry Information



orion ENGINEERED
CARBONS
Focused. Innovative. Responsive.

Orion Engineered Carbons is a leading global manufacturer of Carbon Blacks for pigments, rubber and conductive applications. Our production sites and innovation centres can be found in all regions of the world.

Orion Engineered Carbons is selling Conductive Carbon Blacks under many brand names for example PRINTEX®, HIBLACK®, and LAMP BLACK.

In order to fulfill the challenging expectation of tomorrows energy demands Orion Engineered Carbons is working together with leading industrial companies, major research institutes and universities to be in the first line of future developments for all existing and evolving energy storage devices and their components.

Our Conductive Carbon Blacks offer an excellent balance of electrical conductivity, dispersibility, and adjustability of rheological properties in viscous pastes and slurries. They are suitable for a broad range of energy storage devices in numerous applications such as consumer electronics (3C), electric power tools, e-bikes, energy stationary storage (ESS), telecommunication and electrical power grids (UPS), micro- and mild hybrid electrical vehicles (HEV), full- and plug-in HEV, and full electric vehicles (EV).

Energy Storage Trends & Applications

Batteries and energy storage devices already exist in many parts of our daily life. Improved life time and cost reduction are major targets to increase the benefits of mobile consumer electronics such as cell phones, camcorders, laptops and power tools.

In order to reduce CO₂ emissions and the consumption of fossil resources, megatrend e-mobility advances the development of hybrid electric vehicles (HEV) and full electric vehicles (EV). They are seen as the future technologies for personal and heavy goods transportation. However, for a successful technology transfer to the market further improvement on energy efficiency and price competency are major challenges.

Renewable energy such as wind- and solar parks offer the potential to use a zero emission sustainable energy resource. Unfortunately, these resources are intermittent and variable; only producing energy when the sun shines or when the wind is blowing.

For these energy sources to become a main contributor in providing private households and the electricity grid with electrical power, energy stationary storage (ESS) modules are needed to enable a reliable and stable energy supply.

Conductive Carbon Blacks Benefits in Batteries

Conductive Carbon Blacks can be dispersed in pastes and slurries for all kinds of energy storage devices to adjust rheological properties. This in turn improves the device performance by e.g. reducing the internal series resistance of electrodes. The result is an increase in the power density of energy storage devices which boosts their life time. Furthermore, the volumetric energy density can be adjusted and maximized according to the requirements of the applications. Due to Orion's optimized production processes and raw material selection, the lowest impurity levels are achieved resulting in improved life time of batteries.

Our Conductive Carbon Blacks are applied in the following energy storage devices:

- Enhanced flooded (EFB) and enhanced valve regulated Lead Acid batteries (VRLA) - AGM or gel type
- Classical starter Lead Acid batteries (SLI)
- Ultrabatteries® and LeadCarbon® batteries
- Electrochemical double layer capacitors (EDLC) or Supercapacitors
- Lithium ion batteries (LIB)
- Nickel-metal hydride batteries (NiMH)
- Emerging battery technologies for example Lithium Sulphur (LIS) and Lithium air batteries (Li-Air)

Orion's Conductive Carbon Blacks can be perfectly adjusted and modified to improve manufacturing steps for all kinds of battery electrodes. Due to our optimized production processes and raw material selection, the lowest impurity levels are achieved in order to enhance the life time and performance of batteries even further.

Orion Engineered Carbons' Conductive Carbon Black additives are contributing significantly to all of the above mentioned challenges.



Figure 1: Typical electrical energy storage applications are optimized by Conductive Carbon Blacks

Tailor-made Product Portfolio

Orion's broad product portfolio and a long term experience in production of Conductive Carbon Blacks, in all major production types, enables us to tailor-make our product - depending on our customers' needs. In combination with a long term experience in

CCB Energy Storage device	BET [m ² /g]	OAN [ml/100g]	Performance Remarks
LAMP BLACK 101 SLI EFB VRLA AGM/GEL	29	140	start/stop application in μ -HEV low sulfation level regular water loss
PRINTEX® G SLI EFB	35	140	start/stop application in μ -HEV low sulfation level regular water loss

Table 1: Examples of Conductive Carbon Blacks used in classical starter batteries, enhanced flooded and valve regulated start/stop Lead Acid batteries

Enhanced Dispersibility of Conductive Carbon Blacks in Battery Slurries

Optimal adjustment of Conductive Carbon Black structure, surface area and porosity in combination with selected functional surface groups - depending on applied solvents - is leading to optimal dispersibility behaviour in all applied battery chemistries.

Very high Product Purity

Orion's global access to pure raw materials, our optimized production facilities and the wide variety of production processes are guaranteeing a very high level of purity for our Conductive Carbon Blacks. Specifically, the metal contents can be minimized, as needed for almost every electrochemical application.

battery technologies, Orion is able to supply Conductive Carbon Blacks for solutions depending on customer expectations. Our products can be perfectly adjusted to optimize production processes for electrode production of batteries.

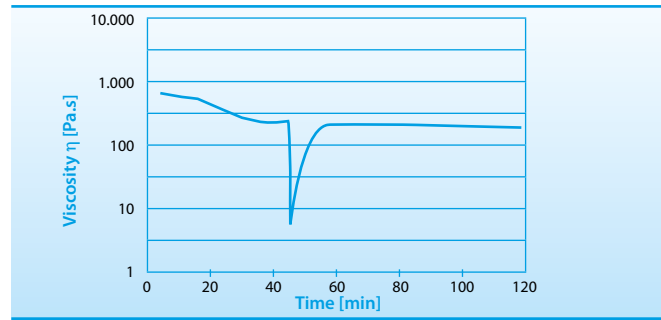


Figure 2: Relaxation experiments on battery slurries with a typical Conductive Carbon Black for optimization of production parameters during the coating process

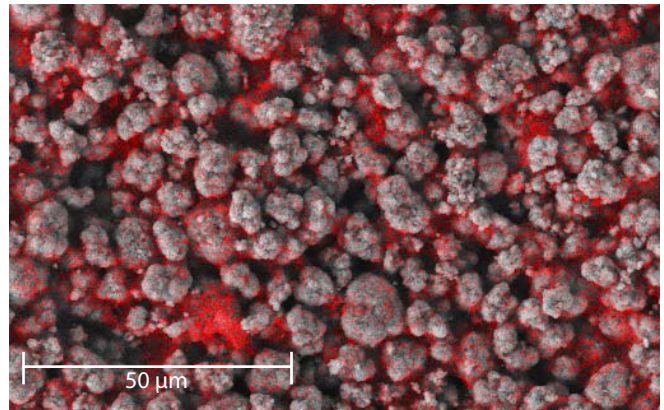


Figure 3: Example of an excellent Conductive Carbon Black (red) dispersion in a Lithium ion cathode (grey) slurry

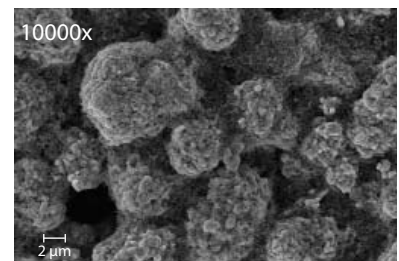
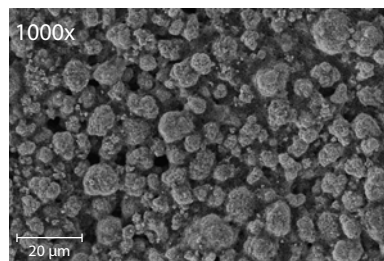
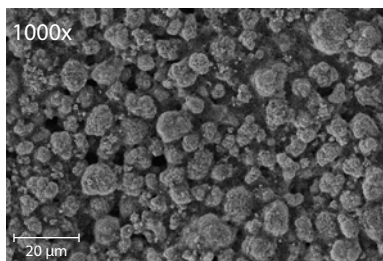


Figure 4: Optimal dispersed Conductive Carbon Blacks in calendared Lithium ion cathode

Efficient global Consulting and local Technical Support

Our global team of sophisticated experts in the energy storage technologies will provide support in the selection of Conductive Carbon Blacks depending on the field of application, battery technology or available processing technologies. We are providing solutions based on knowhow, professionalism and trustful partnership.





The Americas

Orion Engineered Carbons LLC
4501 Magnolia Cove Drive, Suite 106
Kingwood, TX 77345
USA
Phone +1 832 445 3300

AMERICAS@orioncarbons.com

Europe/ Middle East/ Africa

Orion Engineered Carbons GmbH
Hahnstraße 49
60528 Frankfurt am Main
Germany
Phone +49 69 36 50 54 100

EMEA@orioncarbons.com

Asia Pacific

Orion Engineered Carbons Trading (Shanghai) Co., Ltd.
BM Intercontinental Business Centre, Room 3701-3702
100 Yutong Road
200070 Shanghai, China
Phone +86 21 6107 0895

APAC@orioncarbons.com

Global Corporate Headquarters

Orion Engineered Carbons S.A., 6 Route de Trèves, L-2633 Senningerberg, Luxembourg, Phone +352 27 04 80 60

www.orioncarbons.com

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