**FormulaBT™: Superior Performance Graphite/Carbon for Energy Applications**

Graphite/Carbon additives in Lead-acid battery electrodes for use in highly demanding operations such as High-Rate Partial State-of-Charge (HRPSoC)

FormulaBT™ (Battery Technology) are carbon and graphitic powders, developed and manufactured by Superior Graphite, primarily for use in the energy marketplace. FormulaBT™ takes advantage of our proprietary Electro-Thermal Treatment/Purification Technology. This continuous high-temperature process exposes the raw materials, e.g. natural graphite, synthetic graphite and other carbonaceous products to temperatures approaching 3000°C, so that impurities including inorganic contaminants are evaporated. Combined with a variety of milling and classification techniques and processes, FormulaBT™ provides the market with superior performance and high purity products.

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**FormulaBT™ Advantages:**

- **Significant Cycle Life Improvement** - Significant reduction of irreversible sulfation due to hindrance of lead sulfate crystal growth and uniform formation of lead sulfate across the negative plate under high-rate partial state-of-charge (HRPSoC) working conditions
- **Capacity Improvement** - Improving high-rate capability and the charge efficiency of the negative plates through providing excellent electrical conductivity
- **Chemical Stability** - No chemical interference with the electrode components

**FormulaBT™ Characteristics:**

- **High Purity** - High consistent carbon content (>99.9%) with low moisture content, and ultra low metallic and non-metallic impurities
- **High Crystallinity** - Near 100% crystallinity leads to excellent electrical conductivity, thermal conductivity and lubrication performance
- **Defined Texture** - Well-defined particle shape, surface area, as well as bulk density to maximize the nucleating effect for uniform formation of lead sulfate and hinder lead sulfate crystal growth
- **Well-Defined Particle Size Distribution** - Predictability in performance and processability
**Enhanced levels of carbon black & graphite showed significant improvements in VRLA cycle life**

Number of HRPSoC Micro Cycles Completed to 80% Nominal Capacity or Termination

![Graph showing cycle life improvement](image)

**FormulaBT™ significantly improves initial capacity under HRPSoC cycling conditions**

Average 1st and 10th Cycle Capacity
(normalized for dry unformed negative active material weight)

![Graph showing capacity improvement](image)
**FormulaBT™ Products**
Graphite/Carbon additives in Lead-acid battery electrodes for use in highly demanding operations such as High-Rate Partial State-of-Charge (HRPSoC)

**FormulaBT™ ABG series** - Expanded flake graphite powders with high purity. Outstanding thermal and electrical conductivity enhancer for various battery systems (large surface area is in the range of ~20 m$^2$/g), various particle sizes, well-defined particle size distribution. Excellent compressibility and lubricating properties.

**FormulaBT™ LBG series** - Natural flake graphite powders with high purity. Excellent electrical and thermal conductivity enhancer, various particle sizes down to 4 micron, well-defined particle size distribution. Especially developed for battery and fuel cell applications. Very high compressibility and lubricating properties.

**FormulaBT™ 29xx series** - Thermally-purified, natural flake graphite powders from 10 micron up to 800 micron. Conductivity additive for batteries and fuel cells.

**FormulaBT™ is more than just a high performance energy material.**
It’s a philosophy:

- Our innovative research and development team provides superior solutions with customized products.
- Our dedicated production staff, combined with ISO 9001:2015 certified quality management systems ensure high quality products which meet agreed-upon specifications.
- Our extensive worldwide distribution network ensures supply chain efficiency.
- Our materials management experts secure the supply of high quality raw materials, and continuously evaluate new sources globally.

**Our Mission:**
We create value for our customers by providing SUPERIOR SOLUTIONS - utilizing our unique technologies, processes and talents - while contributing to the company’s long-term success.

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Printed in the U.S.A. • Rev. 1/2019