



Sourced and Manufactured in the USA Battery-Ready Natural Purified Micronized Graphite (PMG) for Lithium-ion, Lithium Primary, Lead-Acid & Alkaline Batteries

TECHNICAL DATA SHEET

General Characteristics

Product Name	ULTRA-PMG™
Type	Natural Flake Purified Micronized Graphite
Chemical Name	Graphite
Chemical Element	C
Appearance	Fine dark gray powder
True Density	2.23 g/cm ³
County of Origin	USA
Country of Manufacture	USA
Melting Point	3,750 °C (sublimes)
Molecular Weight	12.01 g/mol
CAS Number	7782-42-5
EC Number (EINECS)	231-955-3
Harmonized Tariff Schedule (HTS US)	2504.10.10.00

Physical Characteristics

Purity (LOI ₉₅₀)	99.95 to 99.99993 wt% C
Ash, wt%	0.05 to 0.00007%
Moisture	<0.1wt%
BET Surface Area	11.2 m ² /g
Tap Density	0.26 g/cm ³

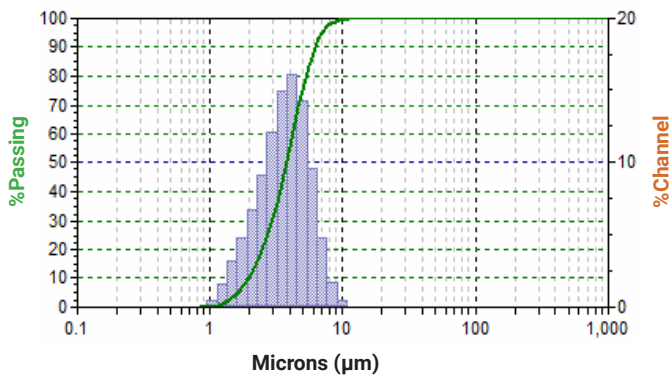
Standard Grades

ULTRA-PMG-45™ Graphite	D ₅₀ = 45 μm
ULTRA-PMG-25™ Graphite	D ₅₀ = 25 μm
ULTRA-PMG-20™ Graphite	D ₅₀ = 20 μm
ULTRA-PMG-15™ Graphite	D ₅₀ = 15 μm
ULTRA-PMG-12™ Graphite	D ₅₀ = 12 μm
ULTRA-PMG-09™ Graphite	D ₅₀ = 9 μm
ULTRA-PMG-075™ Graphite	D ₅₀ = 7.5 μm
ULTRA-PMG-05™ Graphite	D ₅₀ = 5 μm
ULTRA-PMG-035™ Graphite	D ₅₀ = 3.5 μm

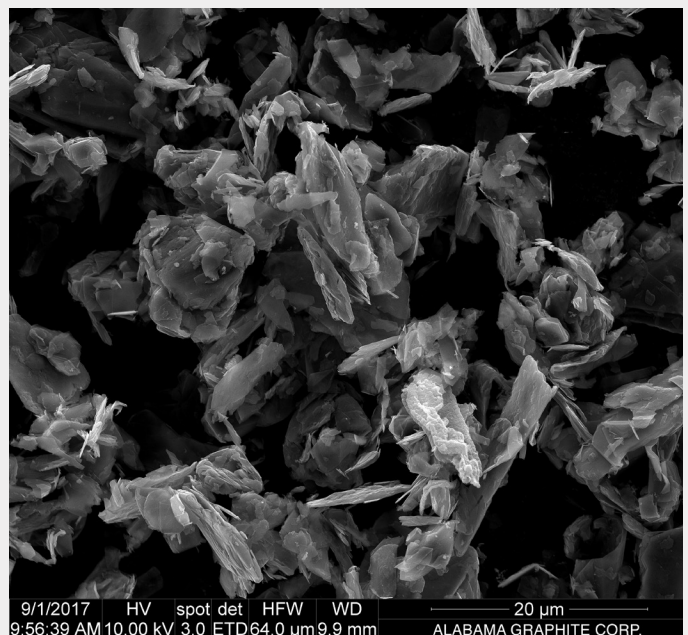
- Alabama Graphite is capable of producing natural ULTRA-PMG™ graphite with D₅₀ ranging from 3 μm to 45 μm (all data presented is based on a D₅₀ particle size of 3.5 μm)
- Low-temperature halogen-gas-based purification and micronization (classification by size) of natural graphite from Alabama Graphite's Coosa Graphite Project was achieved through the Company's innovative, proprietary specialty midstream PMG manufacturing process, which utilizes sustainable specialty engineered methods (that is, without the use of hydrofluoric, hydrochloric, sulfuric, nitric or other acids)

Particle Size Distribution

Laser diffraction particle size analysis by Microtrac S3500



D ₁₀	1.9 μm
D ₅₀	3.5 μm
D ₉₀	6.1 μm
Mean Value	3.9 μm

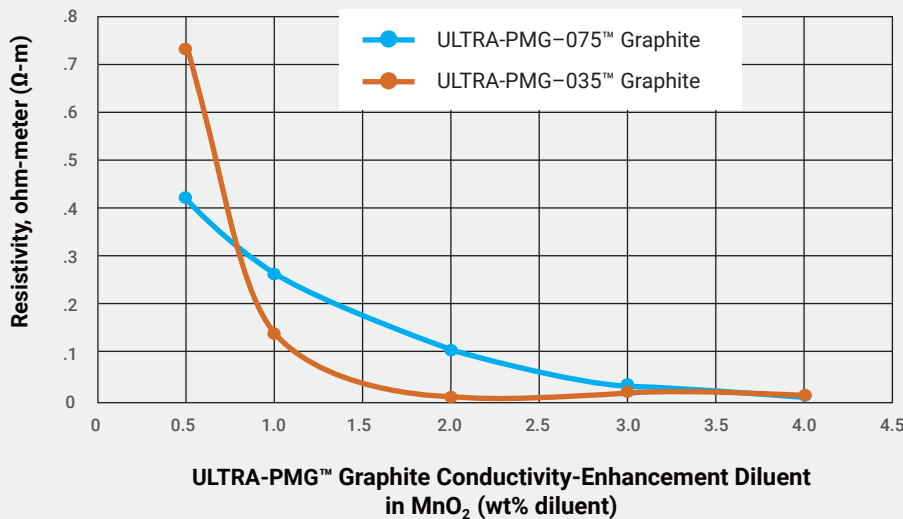


Alabama Graphite's natural ULTRA-PMG™ processed natural graphite for conductivity-enhancement applications



FOUR-TERMINAL-SENSING RESISTIVITY TEST RESULTS (4T SENSING)

TRACE MINERAL IMPURITIES KEY ELEMENTS



Note: AGC was able to achieve two sub-10-micron (μm) size PMG ($D_{50} = 3 \mu\text{m}$ and $D_{50} = 7 \mu\text{m}$) ULTRA-PMG™ conductivity-enhancement materials for its preliminary 4T-sensing resistivity testing.

In the graph above, the horizontal line (or the 'X' axis) represents the weight percent (wt%) addition of conductivity-enhancement graphite in manganese dioxide (MnO_2) matrix as a function of EMD electrode resistivity of the additive. The vertical line (or the 'Y' axis) represents the electrical resistivity measured in SI units of ohm-meters ($\Omega\cdot\text{m}$). The ideal is to obtain the lowest resistivity with the least amount of conductivity-enhancement graphite.

AGC's ULTRA-PMG™ consistently features low resistivity (meaning, higher conductivity) in MnO_2 electrolytic manganese dioxide (EMD) electrode matrices across all practical percentage point additions.

Element	Concentration (ppm)
Ag (Silver)	< 0.05
Al (Aluminum)	1
As (Arsenic)	< 0.05
B (Boron)	4.4
Ba (Barium)	< 0.05
Be (Beryllium)	< 0.01
Bi (Bismuth)	< 0.05
Ca (Calcium)	< 0.5
Cd (Cadmium)	< 0.5
Co (Cobalt)	< 0.05
Cr (Chromium)	< 0.5
Cu (Copper)	< 0.05
Fe (Iron)	8.4
Ga (Gallium)	< 0.05
Ge (Germanium)	< 0.1
Hf (Hafnium)	< 0.05
K (Potassium)	< 0.5
Li (Lithium)	< 0.01
Mg (Magnesium)	< 0.1
Mn (Manganese)	0.14
Mo (Molybdenum)	< 0.05
Na (Sodium)	< 0.05
Ni (Nickel)	< 0.05
P (Phosphorus)	0.3
Pb (Lead)	< 0.1
S (Sulfur)	6
Se (Selenium)	< 0.5
Si (Silicon)	37
Sn (Tin)	< 0.1
Te (Tellurium)	< 0.05
Ti (Titanium)	< 0.05
V (Vanadium)	< 0.05
W (Tungsten)	< 0.05
Zn (Zinc)	< 0.1
Zr (Zirconium)	< 0.05

Data by GDMS

ULTRA-PMG™ GRAPHITE RESISTIVITY DATA

	Resistivity Measurement ($\Omega\cdot\text{m}$)	Graphite Conductivity-Enhancement Diluent in MnO_2 (wt% diluent)
ULTRA-PMG-035™ Graphite	0.016	4
	0.025	3
	0.013	2
	0.137	1
	0.730	0.5
ULTRA-PMG-075™ Graphite	0.015	4
	0.037	3
	0.109	2
	0.250	1
	0.422	0.5

DISCLAIMER

FOR REFERENCE ONLY. The information contained within this product information bulletin is not a product specification. Information provided in this document is supplied to indicate the approximate physical and chemical properties of the material. Customers are strongly urged to test the material independently prior to application/purchase.

QUALIFIED PERSON: Gareth P. Hatch, PhD, CEng, FIMMM, FIET, Chief Executive Officer and Director of Alabama Graphite Corp., is a Qualified Person as defined by National Instrument 43-101 ("N.I. 43-101") guidelines, and has reviewed and approved the scientific and technical disclosure in this technical data sheet.

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