



WONDERSTONE/



TECHNICAL **CERAMICS**
DIAMOND INDUSTRY
INDUSTRIAL **MINERALS**



WONDERSTONE

Wonderstone Ltd is a mining company that is 100% owned by Assore Ltd and has been mining a uniquely pure pyrophyllite deposit since 1937. Wonderstone mine is situated approximately 300 kilometers west of Johannesburg, close to the small town of Ottosdal.

As an entirely independent company since its inception in 1937, Wonderstone Ltd is an innovative company with numerous exciting Research and Development projects currently underway, Wonderstone Ltd. Is ISO 9001:2015 and ISO 14001:2015 certified (Quality and Environmental Management systems) with mining rights issued for 30 years.

Elements		Typical Chemical Analysis (%)
XRF analysis	SiO ₂	58.9
	Al ₂ O ₃	32.5
	TiO ₂	1.84
	K ₂ O	0.89
	Fe ₂ O ₃	0.79
	P ₂ O ₆	0.2
	CaO	<0.1
	MgO	<0.5
	NaO ₂	0.22
	V ₂ O ₆	0.05
	C	0.8
	LOI	6.33
XRD analysis	Pyrophyllite (Al ₂ O ₃ · 4SiOH ₂ O)	78-85
	Quartz (SiO ₂)	Trace
	Kaolinite (Al ₂ O ₃ · 2SiO ₂ ·2H ₂ O)	1 to 6
	Other Phases (Muscovite, Rutile, Chamosite, Gibbsite)	1 to 6
	Rutile (TiO ₂)	1 to 2
	Cristobalite	0 to 1
	Gibbsite (Al(OH) ₃)	Trace



SYNTHETIC/LAB-GROWN DIAMONDS

Wonderstone company have capabilities of producing capsules and gaskets used in the production of synthetic diamonds through direct machining from natural pyrophyllite as well as isostatic powder pressing technology. Our natural pyrophyllite offers higher density which ensures superior pressure transfer properties whilst reducing strains on the anvils, where longer run times are a requirement. In addition, it offers better flow properties owing to its high pyrophyllite content and lattice structure when compared to synthetic materials. It is for these reasons that it finds its applications in the production of large, high-quality diamonds such as stones and Polycrystalline diamond (PCD) for both cubic and belt press technology.

Designed for grit producers, Wonderstone reconstituted pyrophyllite offers improved densities, better flow, and optimal spring-back properties. Our HPHT components are isostatically pressed to ensure better consistency between runs, uniform pressure transfer properties and a density variance of approximately 0.01g/cm³.



Natural				
Property		Unit	Light Grey	Dark Grey
Physical and Mechanical	Water Absorption	%	1.79	0.93
	Density	g/cm³	2.55 - 2.7	2.7 - 2.85
	Hardness	Rockwell	62 - 72	72 - 85
	Compressive Strength	MPa	93.7	
	Flexion Resistance	daN/cm²	120-150	
	Thermal Shock Resistance	-	Excellent	
Thermal	Specific Heat	J/kg °C	1,220-1,306	
	Thermal Conductivity	W/mK	1.5	
	Linear Coefficient of Thermal Expansion (25°C to 100°C)	-	2.9 x 10 ⁻⁶	
	Thermal Shock Resistance	-	Excellent	
Electrical	Dielectric Strength	Volts/mil	100	
	Dielectric Constant @ 20°C (1 MHz)	-	5.3	
	Dielectric Loss Factor @ 20°C (1 MHz)	-	0.053	
	Volume Resistivity	Ohmscm	>1.0 x 10 ¹⁴	
	Electrical Resistivity @ 20°C (1 MHz)	Ohmscm	1.07 X 10 ⁰²	
Reconstituted				
Property	Light Grey	Dark Grey		
Density	2.5 - 2.65	2.60 - 2.65		g/cm³
Hardness	60 - 70	70 - 78		Rockwell

TECHNICAL CERAMICS

The company provides this high-grade pyrophyllite in various forms, including natural rock, reconstituted rods, shaped blocks, and engineered powders. These materials are renowned for their superior thermal shock resistance, incredibly low thermal expansion, and excellent chemical resistance. Notably, the material's green state machinability allows for precise and cost-effective production of complex ceramic shapes, facilitating rapid prototyping and pilot-scale production.

In technical ceramics, Wonderstone's material excels in applications requiring high thermal stability and precision. It maintains good mechanical strength up to 1,200°C, with a melting point of 1,630°C. Common applications include gas and industrial burner tips, welding components, nozzles, electrical insulation parts, and various heat and acid-resistant components. The material's ability to hold close dimensional tolerances without post-firing grinding makes it ideal for intricate designs in electrical, electronic, and industrial settings.

Applications

- Electrical Engineering
- Scientific Research
- Prototype parts and a small series of insulating parts
- Used to make small laboratory furnaces
- MIG and TIG welding nozzle
- Plasma nozzle
- Insulating Components
- Wear parts (sanding tubes, casting nozzles)
- Welding Assembly Supports and Positioning Templates
- Aeration and Filtration
- Fluidization and Regulation
- Wicking and Membrane Support
- Air Bearings and Pneumatic Systems
- Vacuum Hold-down Systems
- Acoustical resistors

Basic Properties

- Good electrical insulator
- Low dielectric loss
- Chemically inert and acid resistant
- Resistant to high temperature
- Excellent resistance to deep vacuum
- Very Low thermal expansion when heated from (1,050-1,300)



INDUSTRIAL MINERALS

Wonderstone powder can be supplied in different particle size distribution customized for customer 's application and selected process requirements.

Wonderstone displays exceptional refractory properties with measured Pyrometric Cone Equivalent values of 29-30 and a high melting point of 1,670°C. When firing above 1,050°C, transformation of pyrophyllite to mullite occurs with significant improvements in mechanical properties such as hardness, compressive strength, and flexural strength. Furthermore, one can expect low reversible thermal expansion, excellent stability when reheated after firing, good insulating properties due to its low thermal conductivity as well as resistant to corrosion by molten metals and slags.

- ### Applications

 - Foundry washes
 - Insulating firebrick
 - Metal pouring refractories
 - Alumina-silica monolithic refractories
 - Kiln car refractories
 - Ceramic Filters
 - Slip Casting
 - Refractory coating



- ### Characteristics of Pyrophyllite on Industrial Mineral Applications

 - Expands permanently on firing (650°C to 870°C) during dehydration of pyrophyllite
 - Low reversible thermal expansion
 - Excellent stability when reheated after firing
 - Good insulating properties – low thermal conductivity
 - Resists corrosion by molten metals and slags
 - Low deformation under hot load
 - When firing above 1,050°C, the transformation of pyrophyllite to mullite occurs with significant improvements in mechanical properties such as hardness, compressive strength, and flexural strength

General Description		SI Units
Description	LG Pyrophyllite Powder (-125 micron)	-
Crystallinity	Laminar to semi-massive	-
Specific Gravity	2.7 to 2.85	g/cm³
PCE (ASTM C-24)	29 to 30	-
Bulk Density	0.69	g/cm³
Tap density	0.98	g/cm³
Coefficient of Thermal Expansion	3.6 x 10-6	°C-1
Melting Point	1,680	°C
Softening Temperature	1,600	°C

CARVING

Pyrophyllite's exceptional softness and consistent texture allow for intricate and detailed carvings, minimizing tool wear and maximizing artistic expression. Its low abrasiveness makes it ideal for delicate work, while its stable composition ensures finished pieces retain their form and detail over time.





Wonderstonesales@assore.com



www.wonderstone.co.za



Ore & Metal Company Ltd. as agents for and on
behalf of Wonderstone LTD

