



MAKING A MATERIAL DIFFERENCE

**CARBORUNDUM UNIVERSAL LIMITED
ELECTRO MINERALS**

THERMAL SPRAY POWDERS



CARBORUNDUM UNIVERSAL LIMITED

Carborundum Universal Limited (CUMI), established as a tripartite joint venture in 1954, is a leading materials sciences engineering solutions provider. CUMI's consolidated revenue is **4,833 crores** and Profit after tax (PAT) of **298 crores** for the financial year 2025. CUMI, part of the 120-year-old Murugappa Group, is listed on the NSE and BSE.

CUMI is a Mines to Market Company whose integrated operations include mining, power generation, fusion, manufacturing, marketing, and distribution. CUMI has over **5,500** employees worldwide who collaborate, innovate and develop high-quality material solutions and world-class services in abrasives, electrominerals, ceramics, refractories and energy storage materials, serving customers in diverse industries including engineering, fabrication, auto and auto components, infrastructure, steel, glass, power generation and distribution, mining and aerospace. CUMI has a wide geographical presence spanning five continents and exports products to over **50 countries**.

CUMI MINERALS

Electro Minerals Division of CUMI (CUMI Minerals) provides tailor-made solutions in the fused and sintered minerals to various industries such as Abrasives, Refractories, Ceramics, Thermal Spray Coating, Blasting, Metal Composites etc.

CUMI MINERALS PRODUCT RANGE

Brown Fused Alumina
White Fused Alumina
Silicon Carbide
Treated Grains
Graphene

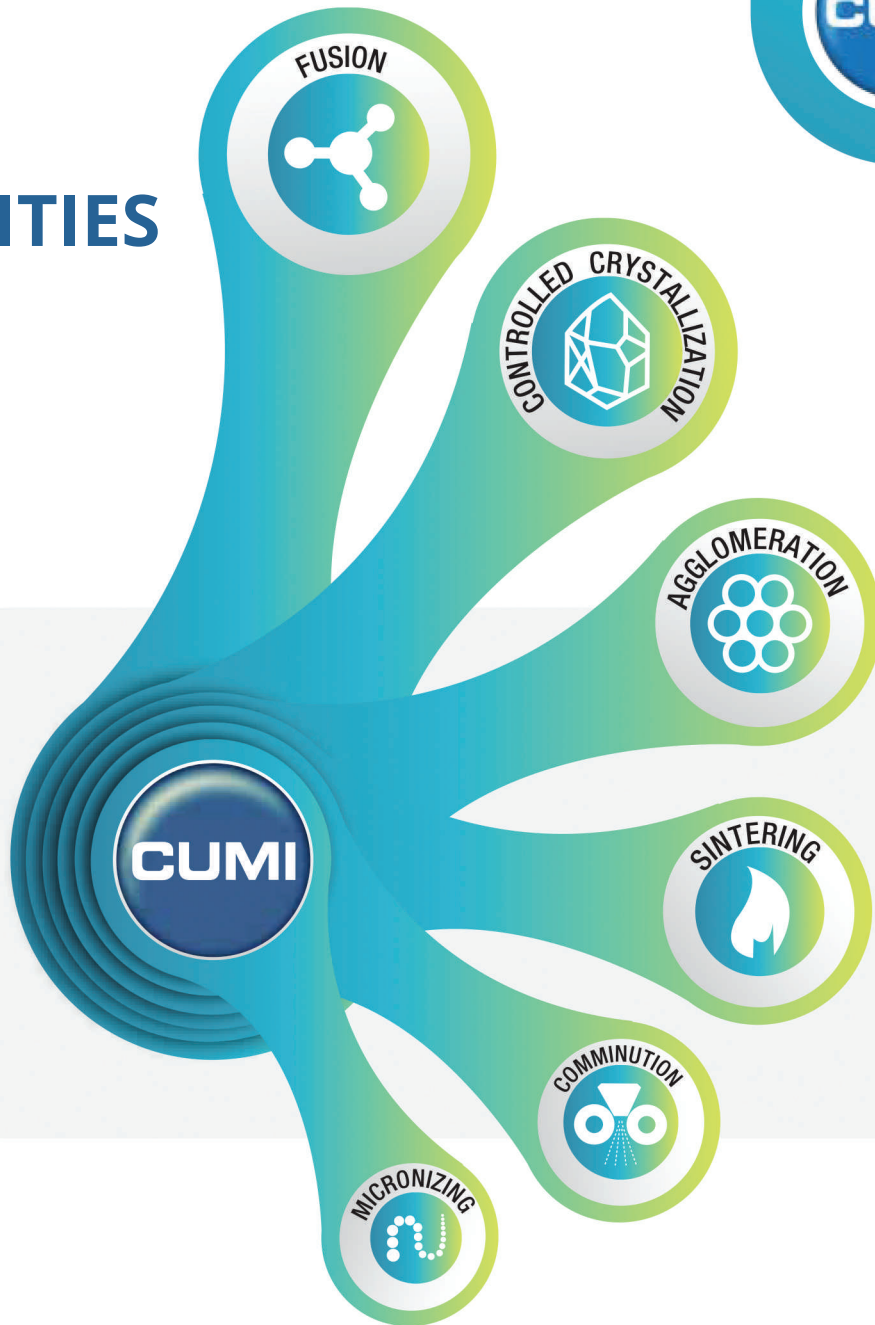
Thermal Spray Powders
Semi friable Alumina
Mono Clinic Zirconia
Sintered Ceramic grains
Alumina Zirconia



For more details, visit
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OUR CAPABILITIES



OUR CERTIFICATIONS



MATERIAL PRODUCT DATA SHEET



Yttria Stabilized Zirconium Oxide Thermal Spray Powders

CUMI *Plas* YSZ

Powder products: 8YSZ 121/121 P, 20YSZ 108, 48YSZ 116/116 P

Introduction

CUMI offers several grades of Yttria Stabilized Zirconia fused and crushed powders for Thermal Barrier Coating (TBC) applications. These Fused and crushed powders have blocky, Angular morphology. These particles have excellent chemical homogeneity and structural stability to produce superior TBC coatings.

Powders are produced from high purity raw materials and hence produce coatings with long lasting, reliable service. Since the chemical homogeneity is high, the undesirable monoclinic phase of Zirconia is controlled to minimum on the coated surface.

TECHNICAL FACTS

Classification	Yttria Stabilized Zirconia Oxide Ceramic powder
Service Temperature	≤1350 °C
Melting Temperature	2800 °C
Morphology	Blocky
Manufacturing method	Fused & crushed
Purpose	Thermal Barrier Coating

Typical Uses and Applications

- Thermal barrier coatings used in rocket and turbine engine combustion chambers and other hot section components.
- Top coat (insulating layer) in a TBC system for industrial and aviation gas turbine engine components such as combustion liners, transition pieces, afterburners, heat shields, turbine airfoils.
- As insulating layer in a two-part TBC system, consisting of a thermal sprayed bond coat and YSZ top coat.
- For some applications, they are used as intermediate layers between an oxidation-resistant bond coat and a more porous, low thermal conductivity TBC coating



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PRODUCT INFORMATION



Chemical Compositions Weight Percent (nominal)

Product Code	ZrO ₂ + HfO ₂	Y ₂ O ₃ (max)	Al ₂ O ₃ (max)	SiO ₂ (max)	TiO ₂ (max)	Fe ₂ O ₃ (max)	MgO (max)	CaO (max)
8YSZ 121	Balance	7 – 8.5	0.2	0.7	0.3	0.3	0.3	0.3
8YSZ 121 P	Balance	7 – 8.5	0.1	0.3	0.1	0.1	0.1	0.1
20 YSZ108	Balance	19-21	0.2	0.7	0.3	0.3	0.3	0.3
48 YSZ 116	Balance	47-49	0.2	0.7	0.3	0.3	0.3	0.3
48 YSZ 116 P	Balance	47-49	0.1	0.02	0.01	0.01	0.01	0.06

P – Premium: High Purity variant

Particle size distribution & Morphology

Product Range	Nominal range (Microns)	Color	Morphology
8YSZ 121	-120 +45	Yellow	Blocky
8YSZ 121 P	-120 +45	White	Blocky
20 YSZ108	-90 + 11	Yellow	Blocky
48 YSZ 116	-115 + 35	Yellow	Blocky
48 YSZ 116 P	-115 + 35	White	Blocky

Particle size analysis using Laser Diffraction Method

Key Properties

Selection of specific powders and spray parameters are dependent on the desired performance and applications. It also depends on the desired coating hardness, density/porosity and surface finish (as sprayed).

- The 8YSZ is widely used as a Thermal Barrier coating over oxidation resistant bond coats
- 20YSZ is typically used for aircraft engine or industrial gas-turbines.
- The higher Yttria containing 48YSZ powder can be used to produce dense TBC structures. It can also be used to protect coatings from CMAS attack.
- The higher Yttria content fully stabilizes the Zirconia; has lower thermal conductivity at elevated temperatures; and higher phase stability.



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PARAMETERS FOR PLASMA SPRAY GUN

All the powders can be sprayed with well-known commercially available Atmospheric Plasma Spray guns. Typical starting parameters using a APS gun with Argon/Hydrogen parameters are shown below. Additional parameters for other APS guns with Nitrogen/Hydrogen can also provide upon request. In general, finer powders are best sprayed with Argon/Hydrogen parameters.

Typical Spray Parameters For Yttria stabilized zirconia Powders

Powder Designation	8YSZ 121	20 YSZ 108	48 YSZ 116
Nominal Range (Microns)	-120 +45	-90 + 11	-115 + 35
Gun Type	APS	APS	APS
Nozzle (mm)	6	6	6
Electrode Type	std	std	std
Injector Type	std	std	std
Injector Diameter(mm)	1.8	1.8	1.8
Injector Angle	90	90	90
Injector Distance(mm)	6	6	6
Current (Amps)	600	630	600
Voltage (Volts)	TBD	TBD	TBD
Argon Flow (slpm)	35	42	35
Hydrogen Flow (slpm)	12	13	12
Powder Carrier Gas	Ar	Ar	Ar
Powder Carrier Gas (slpm)	2.8	3.4	2.8
Powder Feed Rate(g/min)	45	35	45
Spray Distance (mm)	100	120	100





COATING PROPERTIES

The surface properties of these coatings depend on various factors, including powder size, processing conditions, and gun type. A summary of typical plasma coating properties is provided in the following table.

Typical Plasma Coating Properties

Powder Designation	8YSZ 121	20YSZ 108	48 YSZ 116
As sprayed Texture (microns aa)	10 - 15	7 - 10	10 - 15
Coating Hardness (Rc Scale)	30 ± 5	30 ± 5	30 ± 5
Porosity (Volume %)	10 - 15	10 - 15	10 - 15
Density (g/cc)	5.2	5.2	5.2

Note: These are expected properties and spray parameters may require fine-tuning for optimal results

HANDLING & SAFETY INFORMATION

Store in the original container in a dry location. Tumble contents prior to use to prevent segregation.

Safety data sheet is available by request on salesemd@cumi.murugappa.com

PACKING : 5kg bottles/25kg/50kg bags & 1 MT Jumbo bag.
Custom packing can be offered on request.



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MATERIAL PRODUCT DATA SHEET

CUMI

Calcium Stabilized Zirconium Oxide Thermal Spray Powder

CUMI *Plas* CSZ

Powder products: 5CSZ 118

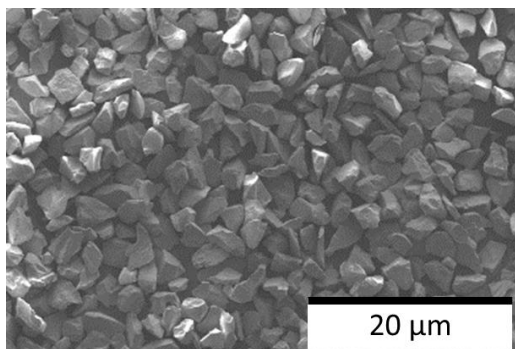
Introduction

Calcium Stabilized Zirconia (CSZ) powder is produced through state of the art electric fusion process followed by crushing, grading operations. More specifically Zirconia stabilized with 5% Calcium finds use in the thermal spray industry. Its formulation aims to create thermal barrier coatings offering thermal insulation, resistance to thermal shock, and protection against hot corrosion and sulfidation in high-temperature environments such as combustion chambers.

Calcium moderately stabilizes zirconia, mitigating phase transitions as the coating transits to temperature-sensitive zones. Consequently, the coatings exhibit reduced susceptibility to dimensional changes.

TECHNICAL FACTS

Classification	5% CaO stabilized Zirconia powder
Chemical Formula	ZrO ₂ 5CaO
Service Temperature	≤1000 °C
Melting Temperature	2565 °C
Morphology	Blocky
Manufacturing method	Fused & crushed
Purpose	Thermal Barrier Coating



SEM micrograph showing Fused & Crushed Morphology of CUMIPLAS CSZ powders



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PRODUCT INFORMATION



Chemical Compositions *Weight Percent (nominal)*

Product Code	ZrO ₂ + HfO ₂	CaO (max)	Al ₂ O ₃ (max)	SiO ₂ (max)	TiO ₂ (max)	Fe ₂ O ₃ (max)	MgO (max)
5CSZ 118	Balance	4.5 – 5.5	0.4	0.05	0.05	0.1	0.2

Particle size distribution & Morphology

Product Code	Nominal Range (microns)	Color	Morphology
5CSZ118	-75+45	Yellow	Blocky

Particle size analysis using Laser Diffraction Method

Key Properties

- CUMIPLAS 5CSZ, fused & crushed powder available in several size distributions.
- The coating with CUMIPLAS 5CSZ, is applicable for Thermal barrier coatings.
- Service in high temperature applications as they provide excellent thermal insulations

Typical Uses and Applications

- Top coat (insulating layer) in a TBC system for industrial and aviation gas turbine engine components such as combustion liners, transition pieces, afterburners, heat shields, turbine air foils.
- Thermal protection at temperatures up to 1000 °C of metallic substrates used in diesel and gasoline engine components such as cylinder heads, piston crowns, exhaust and intake valves, turbocharger.
- To resist particle erosion at temperatures above 845 °C for rocket nozzles and missile nose cones
- Lining for special purpose crucibles to prevent contamination of the molten contents (Coatings to resist wetting and the corrosive effects of molten metal)
- Coatings on tuyeres for iron forging or refining operation.



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PARAMETERS FOR PLASMA SPRAY GUN

All the powders can be sprayed with well-known commercially available Atmospheric Plasma Spray guns. Typical starting parameters using a APS gun with Argon/Hydrogen parameters are shown below. Additional parameters for other APS guns with Nitrogen/Hydrogen can also provide upon special request. In general, finer powders are best sprayed with Argon/Hydrogen parameters.

Typical Spray Parameters For Calcia stabilized zirconia Powders

Powder Designation	5CSZ 118
Nominal Range (Microns)	-75+45
Gun Type	APS
Nozzle (mm)	6
Electrode Type	Std
Injector Type	Std
Injector Diameter (mm)	1.8
Injector Angle	90
Injector Distance (mm)	6
Current (Amps)	600
Voltage (Volts)	TBD
Argon Flow (slpm)	35
Hydrogen Flow (slpm)	12
Powder Carrier Gas	Ar
Powder Carrier Gas (slpm)	1.8
Powder Feet Rate (g/min)	40
Spray Distance (mm)	130



COATING PROPERTIES



The surface properties of these coatings depend on various factors, including powder size, processing conditions, and gun type. A summary of typical plasma coating properties is provided in the following table.

Typical Plasma Coating Properties

Product Designation	5CSZ 118
As sprayed Texture (microns aa)	10 - 15
Coating Hardness (Rc Scale)	30±5
Porosity (Volume %)	10 – 15
Density(g/cc)	5.2

Note: These are expected properties and spray may require specific parameter for optimization.

HANDLING & SAFETY INFORMATION

Store in the original container in a dry location. Tumble contents prior to use to prevent segregation.

Safety data sheet is available by request on salesemd@cumi.murugappa.com

PACKING : 5kg bottles/25kg/50kg bags & 1 MT Jumbo bag.
Custom packing can be offered on request.



MATERIAL PRODUCT DATA SHEET

CUMI

Magnesia Stabilized Zirconium Oxide Thermal Spray Powder

CUMI *Plas* MgSZ

Powder products: 24MgSZ 120

Introduction

CUMIPLAS 24MgSZ is a fused and crushed powder manufactured using high purity raw materials. The consistent powder particle size results in more uniform particle melting during spraying. Zirconia stabilized with 23-25% Magnesia (24MgSZ) are used to get high temperature thermal barriers coatings having low thermal conductivity and high melting point.

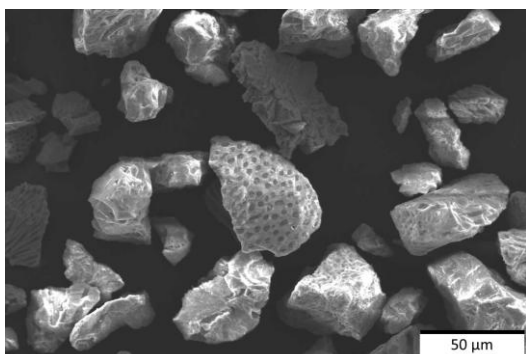
Coatings with CUMIPLAS 24MgSZ powders are resistant to particle erosion in high temperatures and resist wetting of molten zinc, iron, steel, copper and aluminium.

TECHNICAL FACTS

Classification	24%MgO stabilized Zirconia powder
Chemical Formula	ZrO ₂ 24MgO
Service Temperature	≤900 °C
Melting Temperature	2140 °C
Morphology	Blocky
Manufacturing method	Fused & crushed
Purpose	Thermal Barrier Coating

Typical Uses and Applications

- Thermal barrier coatings for combustion section components of industrial gas turbine engines
- Nozzle coatings in metal smelting applications
- High temperature (up to 900°C) wear resistance coatings for aerospace components



SEM micrograph showing Fused &Crushed Morphology of CUMIPLAS 24MgSZ powder



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PRODUCT INFORMATION



Chemical Compositions Weight Percent (nominal)

Product Code	ZrO ₂ + HfO ₂	MgO (max)	Al ₂ O ₃ (max)	SiO ₂ (max)	CaO (max)	Fe ₂ O ₃ (max)
24 MgSZ 120	Bal	23 – 25	0.2	0.1	0.2	0.1

Particle size distribution & Morphology

Product Code	Nominal Range (Microns)	Color	Morphology
24MgSZ 120	-105+45	Yellow	Blocky

Particle size analysis using Laser Diffraction Method

Key Properties

- CUMIPLAS 24MgSZ is a fused & crushed product with blocky morphology result excellent deposition efficiency.
- Coating with CUMIPLAS 24MgZ can be used with high service temperature.



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PARAMETERS FOR PLASMA SPRAY GUN

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Typical Spray Parameters For Magnesia stabilized zirconia Powders

Powder Designation	24MgSZ 120
Nominal Range (Microns)	-105+45
Gun Type	APS
Nozzle (mm)	6
Electrode Type	Std
Injector Type	Std
Injector Diameter (mm)	1.8
Injector Angle	90
Injector Distance (mm)	6
Current (Amps)	600
Voltage (Volts)	TBD
Argon Flow (slpm)	35
Hydrogen Flow (slpm)	12
Powder Carrier Gas	Ar
Powder Carrier Gas (slpm)	2.8
Powder Feet Rate (g/min)	45
Spray Distance (mm)	100



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COATING PROPERTIES



The surface properties of these coatings depend on various factors, including powder size, processing conditions, and gun type. A summary of typical plasma coating properties is provided in the following table.

Typical Plasma Coating Properties

Powder Designation	24MgSZ 120
As sprayed Texture (microns)	10 – 15
Coating Hardness (Rc Scale)	30±5
Porosity (Volume %)	10 – 15
Density (g/cc)	5.2

Note: These are expected properties and spray may require specific parameter for optimization.

HANDLING & SAFETY INFORMATION

Store in the original container in a dry location. Tumble contents prior to use to prevent segregation.

Safety data sheet is available by request on salesemd@cumi.murugappa.com

PACKING : 5kg bottles/25kg/50kg bags & 1 MT Jumbo bag.
Custom packing can be offered on request.



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Monoclinic Zirconia Powders

Monoclinic Zirconia powders are manufactured by an advanced electro-fusion and treatment process followed by precision milling and classification. These powders can be offered in different particle size ranges. Strong control over particle size distribution ensures consistent quality for refractory, abrasives, technical ceramics and thermal spray related applications

Physical Properties

Product Name	Monoclinic Zirconia
Color	Pale Yellow
Melting Point	2715 °C
Crystal Structure	Monoclinic

Typical Chemistry Weight Percent (nominal)

Source	ZrO ₂ +HfO ₂	SiO ₂	TiO ₂	Fe ₂ O ₃	Al ₂ O ₃	MgO	CaO
Spec	Balance	<0.65	<0.20	<0.15	<0.20	<0.08	<0.10
Typical	99.36	0.17	0.16	0.05	0.13	0.04	0.05

Chemical analysis by X-Ray Fluorescence Spectroscopy (XRF) method.

Particle Size Distribution

Typical Particle size distribution in microns analyzed by Malvern Mastersizer 3000 laser particle size analyzer.

Size (µm)	Particle Diameter (<Vol%, µm)		
	D ₁₀	D ₅₀	D ₉₀
2.5	0.75	2.5	5
4.0	1	3.80	7.5
5.0	1.2	4.5	10
6.0	1.3	5.8	12

Packing and brands

5kg / 25 kg / 50 kg bags & 1MT jumbo bags

Custom packing can be offered on request



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MATERIAL PRODUCT DATA SHEET

CUMI

Aluminum Oxide Thermal Spray Powders

CUMI *Plas* A99

Powder products: A99 101/101P, 105,111, 113/113P

Introduction

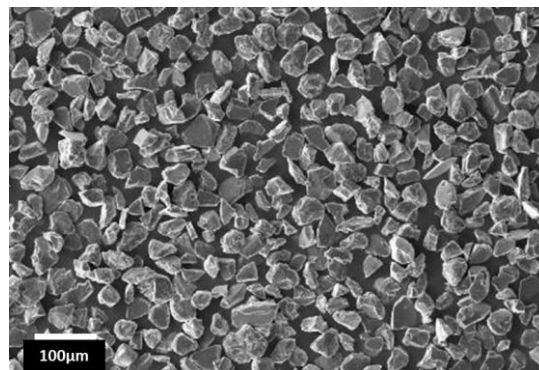
Aluminum oxide (Alumina) is a widely used engineering ceramic known for its hardness, wear resistance, and chemical inertness at high temperatures. High-purity grades offer excellent electrical insulation, corrosion resistance, and hardness. Alumina is commonly used in coating applications, often applied via Atmospheric Plasma Spray. It is used in wear-resistant components like wear pads, seal rings and liners. High-purity alumina also finds applications in electrical, thermal, and biomedical fields, such as insulation and electronic substrates.

TECHNICAL FACTS

Classification	Alumina based Oxide Ceramic powder
Chemical Formula	Al_2O_3
Service Temperature	$\leq 1650^\circ\text{C}$
Melting Temperature	2054°C
Morphology	Angular/blocky
Manufacturing method	Fused & crushed
Purpose	Electrical insulation, wear/abrasion resistance, refractory linings, biomedical implants

Typical Uses and Applications

- Textile and synthetic fiber machinery parts
- Pump Seals
- Wear Pads
- Vacuum chamber liners
- Electrical Insulators
- Electrostatic Chucks and capacitors
- Corona Rolls



SEM micrograph : Fused & Crushed
Morphology of CUMIPLAS A99 powders



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PRODUCT INFORMATION



Chemical Compositions Weight Percent (nominal)

Product Code	Al ₂ O ₃	Na ₂ O (max)	SiO ₂ (max)	Fe ₂ O ₃ (max)	CaO (max)
A99 101	98.5 +	0.75	2.0	-	-
A99 105	98.5 +	0.75	2.0	-	-
A99 111	98.5 +	0.75	2.0	-	-
A99 113	98.5 +	0.75	2.0	-	-
A99 101 P	99.5 +	0.3	0.02	0.05	0.05
A99 113 P	99.5 +	0.3	0.02	0.05	0.05

P – Premium: High Purity variant

Particle size distribution & Morphology

Product Code	Nominal Range (microns)	Color	Morphology
A99 101	-22 + 5	White	Blocky/Crushed
A99 105	-40 + 10	White	Blocky/Crushed
A99 111	-45 + 15	White	Blocky/Crushed
A99 113	-45 + 20	White	Blocky/Crushed
A99 101 P	-22 + 5	White	Blocky/Crushed
A99 113 P	-45 + 22	White	Blocky/Crushed

Particle size analysis using Laser Diffraction Method

Key Properties

- CUMIPLAS A99, a highly purified fused & crushed powder available in several size distributions.
- The coating with CUMIPLAS A99, provide excellent abrasive & wear resistant coating.
- It is insoluble in water media & has excellent alkaline & acid resistance.
- Service upto 1650°C (3000° F)



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PARAMETERS FOR PLASMA SPRAY GUN

**CUMI**

All the powders can be sprayed with well-known commercially available Atmospheric Plasma Spray guns. Typical starting parameters using a APS gun with Argon/Hydrogen parameters are shown below. Additional parameters for other APS guns with Nitrogen/Hydrogen can also be provided upon request. In general, finer powders are best sprayed with Argon/Hydrogen parameters.

Typical Spray Parameters For Alumina Powders

POWDER DESIGNATION	A99 101, 101P	A99 105	A99 111	A99 113, 113P
Nominal range (microns)	22/5	40/10	45/15	45/20
Gun type	APS	APS	APS	APS
Nozzle (mm)	6	6	6	6
Electrode type	std	std	std	std
Injector type	std	std	std	std
Injector diameter(mm)	1.5	1.5	1.5	1.5
Injector angle	90 deg	90 deg	90 deg	90 deg
Injector distance(mm)	6	6	6	6
Current (amps)	650	600	600	600
Voltage (volts)	66	71	71	71
Argon flow (SLPM)	35	41	41	41
Hydrogen flow (SLPM)	12	14	14	14
Powder carrier gas	Ar	Ar	Ar	Ar
Powder carrier gas (SLPM)	3.2	6.5	3.4	3.4
Powder feed rate(g/min)	40	35	40	40
Spray distance (mm)	120	120	120	120



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COATING PROPERTIES



The surface properties of these coatings depend on various factors, including powder size, processing conditions, and gun type. A summary of typical plasma coating properties is provided in the following table.

Typical Plasma Coating Properties

Powder Designation	A99 101, 101P	A99 105	A99 111	A99 113, 113P
Microhardness (HV0.1)	800 - 1200	900 - 1100	1000 - 1100	950 - 1100
Surface Roughness (Ra Microns)	2 - 4	2 - 5	3 - 5	3 - 5
Bondstrength (psi)	6500 - 10,000	6500 - 10,000	6500 - 10,000	6500 - 10,000
Porosity (Vol%)	< 2	< 3	< 4	< 4
Thickness Limit (mm)	0.4	0.4	0.6	0.6
Coating Density (g/cc)	3.4	3.4	3.4	3.4
Powder used (lbs/sq.ft/0.001 in)	0.03	0.03	0.03	0.03

Note: These are expected properties and spray may require specific parameter for optimization.

HANDLING & SAFETY INFORMATION

Store in the original container in a dry location. Tumble contents prior to use, to prevent segregation.

Safety data sheet is available by request on salesemd@cumi.murugappa.com

PACKING : 5kg bottles/25kg/50kg bags & 1 MT Jumbo bag.
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MATERIAL PRODUCT DATA SHEET



Alumina-Titania Thermal Spray Powders (AT Series)

CUMI *Plas* AT

Powder products: AT1, AT3, AT13, AT40

Introduction

Premium range of Alumina-Titania thermal spray powders are produced by fusion of high-quality Aluminum oxide & Titanium Oxide. Alumina-Titania powders are used in thermal spray applications for providing coating for resistance against abrasion, cavitation, erosion, friction & heat & oxidation with a smooth surface finish & a dense coating.

TECHNICAL FACTS

Classification	Alumina-Titania based Oxide Ceramic powder
Melting Temperature (°C)	
Alumina Titania 1% : AT1	2050
Alumina Titania 3% : AT3	2040
Alumina Titania 13% : AT13	2000
Alumina Titania 40% : AT40	1850

ALUMINA-TITANIA (AT) COATINGS

AT1 (1% Titania) & AT3 (3% Titania)

- Denser and tougher coatings
- Hard, sliding wear-resistant, and chemically inert
- Easier to melt and deposit during plasma spraying
- Used in engineering applications, such as wear pads and seal rings
- Service up to 1100 °C

AT40 (40% Titania)

- Moderate hardness and grindability
- Higher fracture toughness
- Recommended for applications requiring hard bearing surfaces and resistance to abrasive grains

AT13 (13% Titania)

- Extremely wear-resistant coatings
- Higher toughness, lower hardness, and less chemical resistance
- Suitable for applications requiring dense, wear-resistant coatings



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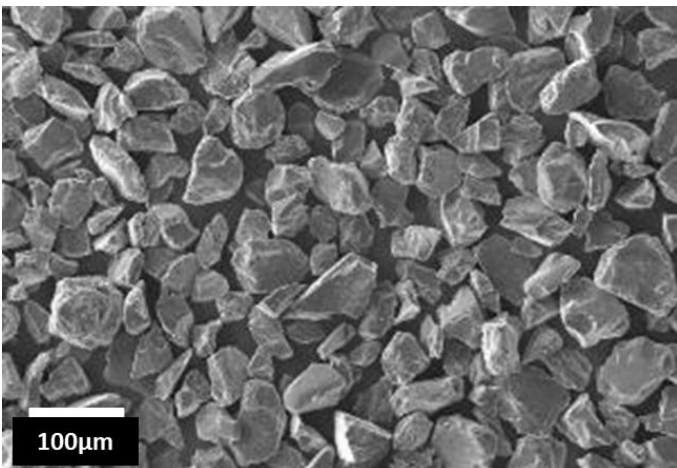
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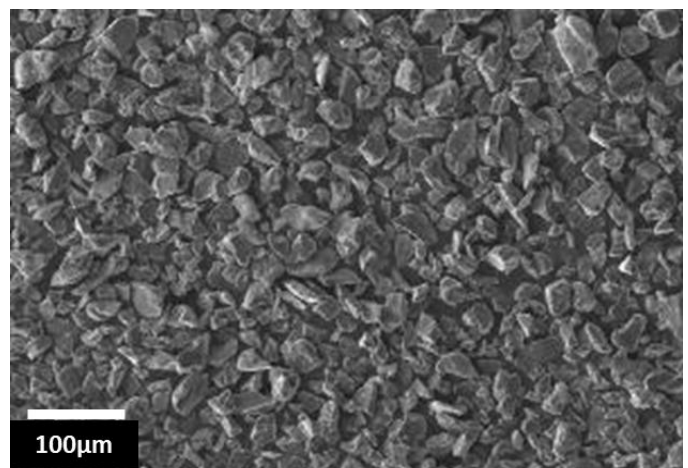
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Typical Uses and Applications

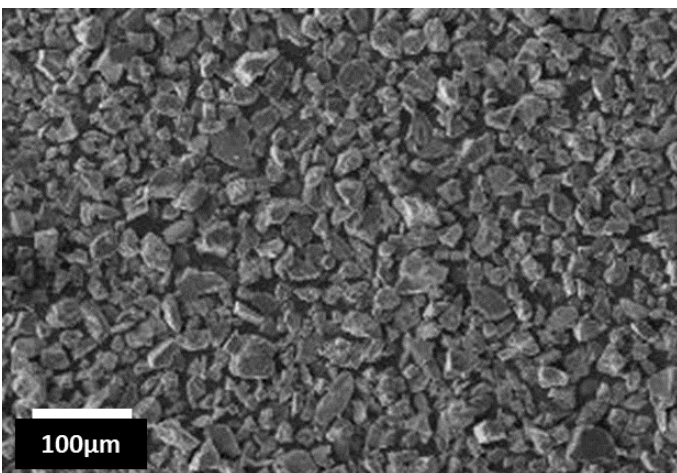
- Lining in pouring troughs to resist against molten metal erosion (Copper, Aluminum and Zinc alloys)
- Resist corrosion against hot gases and chemicals
- Textile and synthetic fiber machinery parts
- Pump Seals and Cylinder Liners against cavitation erosion
- Valve plugs, seats, pump plungers and rotating seal rings
- Abrasive coatings in gas turbine industry in clearance control
- Components for the chemical industry to resist weak acidic conditions
- Electrical insulation and dielectric applications



AT 3



AT 13



AT 40

SEM micrographs showing Fused & Crushed Morphology of CUMIPLAS AT powders

PRODUCT INFORMATION



Chemical Compositions *Weight Percent (nominal)*

Product Code	Al ₂ O ₃	TiO ₂	SiO ₂ (max)	Fe ₂ O ₃ (max)	CaO(max)	Other oxides
AT1 104	Balance	1 – 1.2	0.05	0.05	0.05	-
AT3 113	Balance	2 - 4	0.2	1.0	-	0.9
AT3 120	Balance	2 - 3	0.5	0.1	0.1	-
AT13 101	Balance	12 – 14	0.24	0.11	-	-
AT13 105	Balance	12 – 14	0.24	0.11	-	-
AT40 103	Balance	38 - 42	0.6	0.25	-	-

Particle size distribution & Morphology

Product Code	Nominal range (Microns)	Color	Morphology
AT1 104	-35+10	White	Angular/Blocky
AT3 113	-45+20	White	Angular/Blocky
AT3 120	-105+45	White	Angular/Blocky
AT13 101	-25+5	White	Angular/Blocky
AT13 105	-40 +10	White	Angular/Blocky
AT40 103	-45+10	White	Angular/Blocky

Particle size analysis using Laser Diffraction Method

KEY PROPERTIES

- Higher Titania containing powders will have slightly lower hardness, lower dielectric strength and better density and impact resistance.
- AT13 101, being a finer powder, produces coatings that are harder and denser with smoother as-sprayed surface finishes than AT13 105.
- AT13 101 and AT13 105 are both recommended for resistance to wear by abrasive grains, hard surfaces, fiber, threads, fretting, cavitation and particle erosion.
- AT40 103 are better when a tougher and more impact resistant coating is desired. They are appropriate for applications such as printing ink transfer rolls, textile components, petrochemical applications (pump sleeves), mechanical seals and as electrical insulators.



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PARAMETERS FOR PLASMA SPRAY GUN

All the powders can be sprayed with well-known commercially available Atmospheric Plasma Spray guns. Typical starting parameters using a APS gun with Argon/Hydrogen parameters are shown below. Additional parameters for other APS guns with Nitrogen/Hydrogen can also provide upon request. In general, finer powders are best sprayed with Argon/Hydrogen parameters.

Typical Spray Parameters For Alumina Titania Powders

Powder Designation	AT3 113	AT13 101	AT40 103
Nominal Range (Microns)	-45 + 20	-25+5	-45+10
Gun Type	APS	APS	APS
Nozzle (mm)	6	6	6
Electrode Type	std	std	std
Injector Type	std	std	std
Injector Diameter(mm)	1.8	1.8	1.8
Injector Angle	90 deg	90 deg	90 deg
Injector Distance(mm)	6	6	6
Current (Amps)	600	600	600
Voltage (Volts)	67	69	67
Argon Flow (slpm)	35	30	30
Hydrogen Flow (slpm)	12	10	10
Powder Carrier Gas	Ar	Ar	Ar
Powder Carrier Gas (slpm)	3.2	3.3	3.1
Powder Feed Rate(g/min)	50	50	50
Spray Distance (mm)	120	120	120





COATING PROPERTIES

Thermal spray coatings typically exhibit high residual stresses, primarily The surface properties of these coatings depend on various factors, including powder size, processing conditions, and gun type. A summary of typical plasma coating properties is provided in the following table.

Typical Plasma Coating Properties

Powder Designation	AT3 113	AT13 101	AT40 103
Microhardness (HV0.1)	900 - 1050	850 - 1000	800- 1000
Surface Roughness (Ra Microns)	3 - 5	1 - 4	1 - 4
Bondstrength (psi)	6500 - 10,000	6500 - 10,000	6500 - 10,000
Porosity (Vol%)	< 4	< 2	< 2
Thickness Limit (mm)	0.6	0.4	0.6
Coating Density (g/cc)	3.4	3.4	3.4
Powder used (lbs/sq.ft/0.001 in)	0.03	0.025	0.03

Note: These are expected properties and spray may require specific parameter for optimization.

HANDLING & SAFETY INFORMATION

Store in the original container in a dry location.Tumble contents prior to use to prevent segregation.

Safety data sheet is available by request on salesemd@cumi.murugappa.com

PACKING : 5kg bottles/25kg/50kg bags & 1 MT Jumbo bag.
Custom packing can be offered on request.



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MATERIAL PRODUCT DATA SHEET



Titanium Oxide Thermal Spray Powder

CUMI *Plas* T99

Powder products: T99 117

Introduction

Titanium Oxide (Titania) coatings are used for a wide variety of applications that include wear resistant coatings, dry lubricious coatings and decorative coatings. Overall, coatings of pure titanium oxide exhibit very good toughness for a ceramic material. Thermal spray coating shields against corrosion, oxidation, and erosion, minimizing maintenance, replacement, and downtime costs. CUMIPLAS T99, coatings exhibit exceptional workability due to their intermediate hardness, provide modest electrical conduction, and possess certain self-lubricating characteristics.

TECHNICAL FACTS

Classification	Titania based Oxide Ceramic powder
Chemical Formula	TiO ₂
Service Temperature	≤600 °C
Melting Temperature	1850 °C
Morphology	Angular/blocky
Manufacturing method	Fused & crushed
Purpose	Wear/abrasion resistance

Typical Uses and Applications

- Electrically conductive coatings for sputter targets for use in thin film processes to produce thin Titania films on architectural and automotive glass
- Sliding wear resistance for automotive applications such as cylinder bore liners
- Oxygen sensors
- Decorative coatings having a dark gray color
- Mandrels for the production of dry cell batteries
- Filter elements and membranes



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PRODUCT INFORMATION



Chemical Compositions *Weight Percent (nominal)*

Product Code	TiO ₂	Al ₂ O ₃ (max)	SiO ₂ (max)	Fe ₂ O ₃ (max)	Others
T99 117	99.5+	0.1	0.12	0.05	0.15

Particle size distribution & Morphology

Product Code	Nominal Range (microns)	Color	Morphology
T99 117	-120+40	Black	Angular / Blocky

Particle size analysis using Laser Diffraction Method

Key Properties

- **CUMIPLAS T99**, a highly purified fused & crushed powder available in several size distributions.
- The coating with **CUMIPLAS T99**, is suitable for thicker & denser coating.
- Common application for wear & friction, denser & thicker coatings.



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PARAMETERS FOR PLASMA SPRAY GUN

**CUMI**

All the powders can be sprayed with well-known commercially available Atmospheric Plasma Spray guns. Typical starting parameters using a APS gun with Argon/Hydrogen parameters are shown below. Additional parameters for other APS guns with Nitrogen/Hydrogen can also provide upon request. In general, finer powders are best sprayed with Argon/Hydrogen parameters.

Typical Spray Parameters For Titania Powders

Powder Designation	T99 117
Nominal Range (Microns)	-120+40
Gun Type	APS
Nozzle (mm)	6
Electrode Type	Std
Injector Type	Std
Injector Diameter (mm)	1.8
Injector Angle	90
Injector Distance (mm)	6
Current (Amps)	600
Voltage (Volts)	TBD
Argon Flow (slpm)	38
Hydrogen Flow (slpm)	12
Powder Carrier Gas	Ar
Powder Carrier Gas (slpm)	3
Powder Feet Rate (g/min)	50
Spray Distance (mm)	120



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COATING PROPERTIES

The surface properties of these coatings depend on various factors, including powder size, processing conditions, and gun type. A summary of typical plasma coating properties is provided in the following table.

Typical Plasma Coating Properties

Powder Designation	T99 117
As sprayed Texture (microns aa)	10 – 15
Coating Hardness (Rc Scale)	50±5
Porosity (Volume %)	<3%
Density (g/cc)	4.1

Note: These are expected properties and spray parameters may require fine-tuning for optimal results

HANDLING & SAFETY INFORMATION

Store in the original container in a dry location. Tumble contents prior to use to prevent segregation.

Safety data sheet is available by request on salesemd@cumi.murugappa.com

PACKING : 5kg bottles/25kg/50kg bags & 1 MT Jumbo bag.
Custom packing can be offered on request.

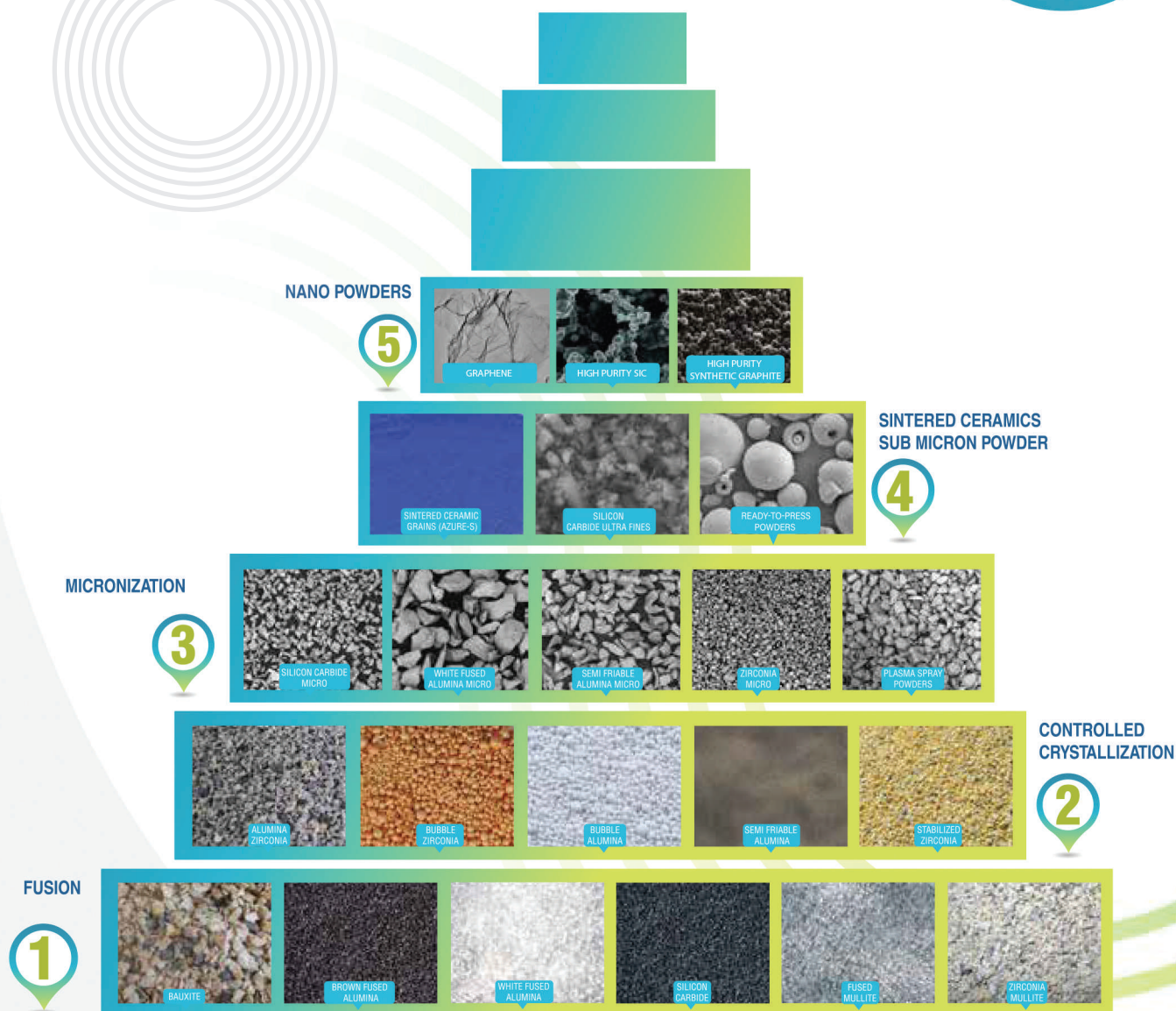
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