



SPECIALTY ALUMINAS FOR  
**STANDARD CERAMICS**

2018

# ALUMINAS FOR CERAMICS



Aluminium oxide, alumina, is present in a wide range of ceramic applications including engobes, glazes and frits. It is also extensively used in technical ceramics\*, please refer to the brochure « Specialty Aluminas for Technical Ceramics » for comprehensive information about Alteo products for these applications.

Alumina offers high mechanical resistance and hardness, as well as surface effects such as a matt, semi-matt or glossy finish, depending on the type of alumina used.

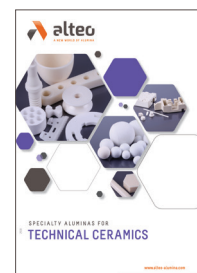
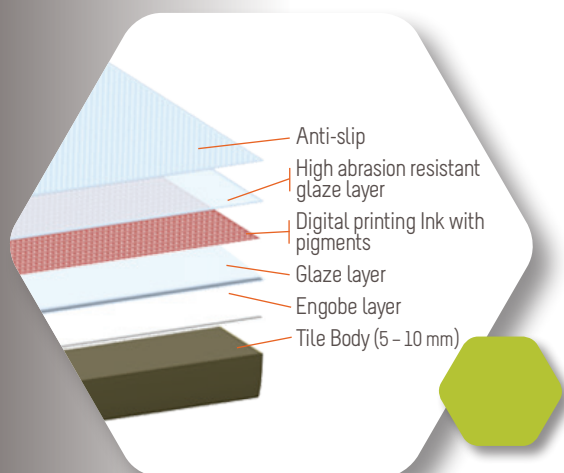
Additionally, alumina ceramics exhibit very favourable thermal properties providing dimensional stability.

Besides chemical purity, other important parameters of alumina for ceramics are the size of its alpha-alumina crystals and alpha-alumina content. For standard ceramics this translates to specific surface area (BET), average particle size (D50), and the degree of calcination.

During the process of calcination, aluminium trihydroxide passes through some transitional structures and finally  $\alpha$  alumina crystals appear and grow, while specific surface area decreases.

For unground calcined alumina, there is a relationship between specific surface area and  $\alpha$  crystal size.

Alteo offers a continuous and tightly controlled range of crystal sizes for ceramists.



\* For Technical Ceramics, see our specific brochure

The appropriate alumina-based product by application:

Applications	Dry Hydrate	Calcined alumina		
		Low calcined	Medium calcined	Hard calcined
Engobes & Glazes		●	●	●
Opacification			●	
Antislip				●
Digital Printing		●	●	●
Frits	●	●	●	●
Pigment	●	●	●	●
Tableware & Sanitary ware				●

# ALUMINAS FOR ENGOBES AND GLAZES

## Low and hard calcined aluminas for engobes and glazes

The use of alumina in the composition of glazes is essential to provide high mechanical strength, wear resistance, thermal shock and chemical corrosion resistance. The glaze can be matt or glossy, transparent or opaque. Hard calcined alumina gives a shiny effect, while reactive alumina gives a matt and opaque effect. Hard calcined alumina controls thermal expansion of the engobes.

	Unit	MATT	SEMI MATT		GLOSSY TRANSPARENT
		Unground			
		Reactive	Semi-reactive		Hard calcined
		AR75	AR12	ARZ®	AC44
<b>Physical properties</b>					
Particle Size Distribution (Cilas)					
D10	µm	40	25	25	15
D50	µm	90	55	55	65
D90	µm	160	95	95	115
<125µm (120 mesh)	%	80	97	98	92
Specific Surface Area BET	m <sup>2</sup> /g	75	12	9	0.55
Crystal size	µm	<0.1	<0.5	<0.5	2.5
Loose bulk density	g/cm <sup>3</sup>	1	1	0.90	0.75
Loss on ignition (20-1000°C)	%	1.40	0.60	0.45	0.10
<b>Chemical properties</b>					
Alpha alumina content	%	≈25	≈75	≈85	>97
Al <sub>2</sub> O <sub>3</sub> - on dry basis	%	99.7	99.6	99.6	99.6
Na <sub>2</sub> O total	ppm	2200	3400	3400	3200
CaO	ppm	150	150	150	150
SiO <sub>2</sub>	ppm	100	100	100	100
Fe <sub>2</sub> O <sub>3</sub>	ppm	115	115	115	115

*Typical data*



# ALUMINAS FOR OPACIFICATION (ZIRCON SUBSTITUTION)

The light scattering properties and high refractive index of medium calcined alumina ARZ® makes it ideal for opacifying in superwhite bodies, engobes and glazes. Specialty reactive alumina can replace totally, or partially, zircon sand in formulations to give whiteness and opacification. Ground alumina can be used as a whitening agent after the milling of the body to obtain the best whiteness.



		Engobes and glazes		Body
		Medium calcined		
		Unground		Ground
		ARZ®	AR12	AFRZ®
Physical properties		Unit		
Particle Size Distribution (Cilas)				
D50	µm	55	55	5.5
<45µm (325 mesh)	%	35	30	100
<125µm (120 mesh)	%	98	97	/
Specific Surface Area BET	m <sup>2</sup> /g	9	12	11
Crystal size	µm	<0.5	<0.5	<0.5
Loss on ignition (20-1000°C)	%	0.45	0.6	0.9
Chemical properties				
Alpha alumina content	%	≈85	≈75	≈75
Al <sub>2</sub> O <sub>3</sub> - on dry basis	%	99.6	99.6	99.6
Na <sub>2</sub> O total	ppm	3400	3400	3400
CaO	ppm	150	150	150
SiO <sub>2</sub>	ppm	100	100	100
Fe <sub>2</sub> O <sub>3</sub>	ppm	115	115	115

Typical data

# ALUMINAS FOR ANTISLIP

Specialty aluminas can be added to increase the coefficient of friction (COF) and therefore anti-slip property of tiles.

In particular this applies to unglazed, mosaic and rough-surfaced tiles for kitchens, bathrooms and swimming pools, as well as for many industrial areas.

Our R&D team is currently developing new products in order to propose alternative high-end solutions.



		Hard calcined
		AC44
Physical properties		Unit
Particle Size Distribution (Cilas)		
D10	µm	15
D50	µm	65
D90	µm	115
<125µm (120 mesh)	%	92
Specific Surface Area BET	m <sup>2</sup> /g	0.55
Crystal size	µm	2.5
Loss on ignition (20-1000°C)	%	0.1
Chemical properties		
Alpha alumina content	%	>97
Al <sub>2</sub> O <sub>3</sub> - on dry basis	%	99.6
Na <sub>2</sub> O total	ppm	3200
CaO	ppm	150
SiO <sub>2</sub>	ppm	100
Fe <sub>2</sub> O <sub>3</sub>	ppm	115

Typical data

# ALUMINAS FOR CERAMIC INKS AND GLAZES

## for full digital decoration

# DIGIT<sup>al</sup>

DIGITal is a superground alumina range with a very well controlled particle size distribution and top cut. Being very fine permits these aluminas to be used in ink and full digital glazing, providing distinctive and unique colour brightness, texture and surface effects.

		Low calcined	Medium calcined	Hard calcined
		DIGITal® 70	DIGITal® 40	DIGITal® 20
<b>Physical properties</b>	<b>Unit</b>			
Particle Size Distribution (Cilas)				
D10	µm	0.20	0.25	0.20
D50	µm	0.4	0.5	2.9
D90	µm	1	1.5	8
Screen residue >45µm (325 mesh)	%	0	0	0
Specific Surface Area BET	m <sup>2</sup> /g	7.5	6.5	1.6
Crystal size	µm	0.4	<0.5	2.6
Loss on ignition (20-1000°C)	%	0.4	0.4	0.3
<b>Chemical properties</b>				
Alpha alumina content	%	≈95	≈93	>97
Al <sub>2</sub> O <sub>3</sub> - on dry basis	%	99.9	99.7	99.8
Na <sub>2</sub> O total	ppm	700	2200	2000
CaO	ppm	200	200	150
SiO <sub>2</sub>	ppm	400	200	135
Fe <sub>2</sub> O <sub>3</sub>	ppm	170	135	120

*Typical data*

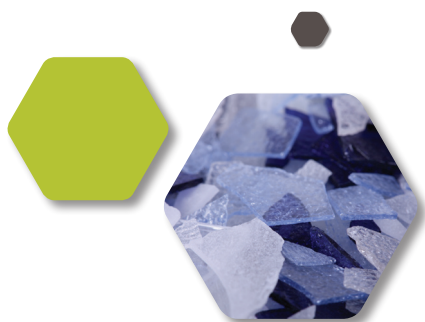


## ALUMINAS FOR FRITS

Alumina is a component of the amorphous glass network.

$Al_2O_3$  is used as a stabilizer in the glass network to avoid recrystallization.

Depending on the required effect reactive alumina AR75, semi reactive alumina ATS, hard calcined alumina AC44, or hydrated alumina SH500, can be used in this application.



		Unground	
		Low calcined	Calcined
		AR75	ATS
Physical properties	Unit		
Particle Size Distribution (Cilas)			
D50	$\mu m$	90	65
<125 $\mu m$ (120 mesh)	%	80	90
Specific Surface Area BET	$m^2/g$	75	*
Crystal size	$\mu m$	<0.1	/
Loose bulk density	$g/cm^3$	1.0	0.9
Loss on ignition (20-1000°C)	%	1.4	0.7
Chemical properties			
Alpha alumina content	%	≈25	/
$Al_2O_3$ - on dry basis	%	99.7	99.6
$Na_2O$ total	ppm	2200	3000
CaO	ppm	150	200
$SiO_2$	ppm	100	200
$Fe_2O_3$	ppm	115	150

\* 0.5 < BET < 80 $m^2/g$

Typical data

## ALUMINAS FOR PIGMENTS

Various types of ATH (Aluminium Trihydroxide) and aluminas are used to enhance colour. These build chemical complexes with other metallic oxides and help the development of tints.

From Alteo's wide range of products we have selected ATH and ground calcined aluminas ideal for this application.



		Ground			
		ATH	ATH	Medium calcined	Hard calcined
		SH30	SH80	AR12B5	AC34B4
Physical properties	Unit				
Particle Size Distribution (Cilas)					
D10	$\mu m$	1	3	1.3	0.5
D50	$\mu m$	4.0	8.5	5.5	4.0
D90	$\mu m$	10	18	16	12
<45 $\mu m$ (325 mesh)	%	100	100	100	99.5
Specific Surface Area BET	$m^2/g$	9.5	3.5	12.5	1.0
Crystal size	$\mu m$	/	/	<0.5	2.6
Loss on ignition (20-1000°C)	%	34.6	34.6	0.90	0.20
Chemical properties					
Alpha alumina content	%	/	/	≈75	>97
$Al_2O_3$ - on dry basis	%	65.0	65.0	99.6	99.7
$Na_2O$ total	ppm	2300	2300	3400	2200
CaO	ppm	135	100	165	175
$SiO_2$	ppm	70	60	100	125
$Fe_2O_3$	ppm	95	65	115	150

Typical data

# GROUND CALCINED ALUMINA FOR TABLEWARE & SANITARY WARE

Ground calcined alumina is used in ceramic bodies to adjust mineralogical composition to provide high-performance, which is required for intensive-use hotel ware and domestic tableware

- Improves thermal shock
- Improves scratch and abrasion resistance
- Improves mechanical resistance

These properties are also required for sanitary ware.

		Ground hard calcined		
		AC44B4	AC44B5	AC44B6
Physical properties	Unit			
Particle Size Distribution (Cilas)				
D10	μm	0.5	0.6	0.7
D50	μm	4	5	6
D90	μm	12	15	17
Screen residue >45μm (325 mesh)	%	0.5	2.5	4.0
Top cut	%	45	63	75
Specific Surface Area BET	m <sup>2</sup> /g	1.0	0.9	0.8
Crystal size	μm	2.5	2.5	2.5
Loss on ignition (20-1000°C)	%	0.20	0.15	0.15
Chemical properties				
Alpha alumina content	%	>97	>97	>97
Al <sub>2</sub> O <sub>3</sub> - on dry basis	%	99.6	99.6	99.6
Na <sub>2</sub> O total	ppm	3200	3200	3200
CaO	ppm	175	175	175
SiO <sub>2</sub>	ppm	125	125	125
Fe <sub>2</sub> O <sub>3</sub>	ppm	150	150	150



## ALTEO R&D

For Alteo, innovation and application R&D are major parts of its growth strategy.

Alteo enhances its R&D capabilities through its **application laboratory**: the installation of **state-of-the-art equipment**, the recruitment of **technical experts** and collaborations with key partners and **university laboratories**.

Alteo has the know-how and equipment to analyze and evaluate raw materials and finished parts, as well as being able to simulate production processes.

Contact our R&D team now at  
[www.alteo-alumina.com/contact](http://www.alteo-alumina.com/contact)

## CUSTOMER CARE COMMITMENT

To meet your highest expectations, our Customer Care team will always strive to ensure a **first class** service.

Our commitment is to provide **full support** from your first call to the delivery of our products; with technical assistance, packing solutions and short lead times.

### R&D CAPABILITIES

Mixing with fluxes

Wet milling & dispersion  
Slurry properties  
Spray drying  
Paste preparation

Mills  
Rheometer  
Zetameter  
Spray dryer  
Kneader

Shaping

Press  
Slip casting  
Piston extruder

Sintering

Kilns  
Debinding kiln  
Dilatometer

## ALTEO AT A GLANCE

- A world leading fully-integrated supplier of specialty aluminas with a capacity of more than 600 000 tonnes of alumina based products (hydrates and calcined aluminas).
- Global sales network with 4 regional hubs, 14 offices and local warehouses around the world.
- Development centre in France.
- Leading raw material supplier to the following industrial markets: Ceramics, Refractories, Specialty Glass, Polishing, Fillers and Coatings.



[www.alteo-alumina.com](http://www.alteo-alumina.com)