



High Purity Alumina | BAIKALOX[®]

3 & 4N - SUB-MICRONIC PARTICLES - POWDER PROCESSING

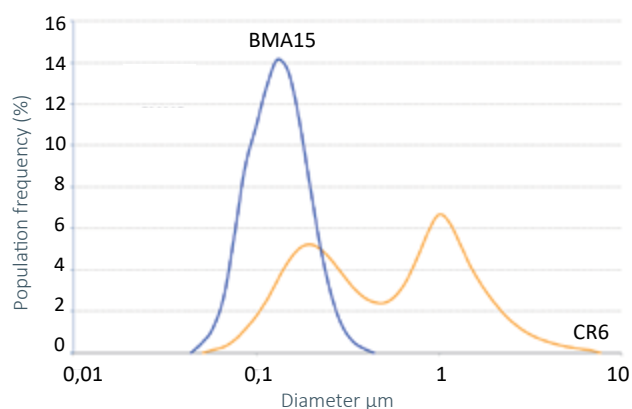
Characteristics

> Thanks to Baikowski[®]'s complementary process routes (Alum, Modified Bayer and Aluminium Hydrolysis) our high-purity alumina powders can be engineered with **precise control over key material characteristics**:

- Particle size & particle size distribution (PSD)
- Chemical purity (3N and 4N)
- Crystalline phase
- Specific surface area (wide range of SSA available)
- Morphology

These parameters can be **customised** to support specific processing requirements and end-use applications.

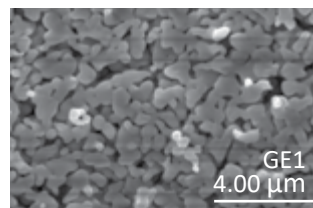
> Example of particle size distributions



Baikalox[®] range

> Most of our alumina powders are available in agglomerated or deagglomerated forms, including jet-milled, dry-milled, ball-milled, wet-milled and spray-dried grades, with or without binder. Further **customisation**, such as **dopant** addition, is also possible upon request.

> 4N unground alumina powders



Baikalox [®] products (Typical values)		SA80	A125	BA105	GE30	GE15	BA20	BA15	GEA6	GE6	GE1
Crystalline phase (%) γ/α		Transition	100/0	92/8	20/80	10/90	3/97	0/100			
Specific Surface Area (m ² /g) BET		80	106	97	25	14	21	15	6	6	<3
PSD (μm)	d ₅₀	20.6	2.0	2.5	4.5	5.5	4.5	4.5	8.0	8.0	13.5
Bulk density (g/cm ³)		-	0.2	0.3	0.3	0.4	0.3	0.3	0.3	0.4	0.5
Tapped density (g/cm ³)		-	0.3	0.5	0.6	0.7	0.5	0.5	0.4	0.7	0.8
Elemental Analysis (ppm) ICP	Na	2	10	12	12		13		12		
	Si	10	12	7	18		12		20		
	Fe	3	4	3	4		5		4		
	Ca	0	2	1	2		2		2		
	K	-	20	14	19		18		18		

The here listed products provide a non-exhaustive overview of our current range – Feel free to contact us for more details.

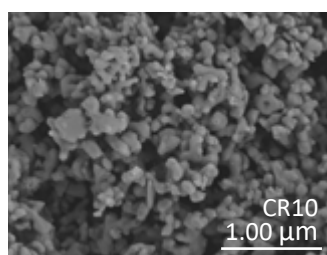
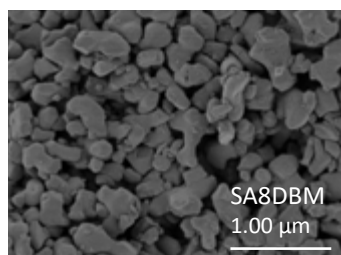


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> 4N milled alumina powders

Milled routes		Jet-milled								Dry-milled				
Baikalox® products (Typical values)		CR125	BRA105	CR30F	CR15	CR10	CR1	CR6	CRA6	BMA15	SM8	SMA6	SA8 DBM	SA5 DBM
Crystalline phase (%) γ/α		100/0	90/10	20/80	10/90	5/95	0/100							
Specific Surface Area (m ² /g) BET		105	95	26	15	7	3	6	5	15	10	7	8	5
PSD (μm)	d ₅₀	1.0	1.0	0.2	0.3	0.3	1.0	0.5	0.4	0.1	0.2	0.2	0.3	0.8
Bulk density (g/cm ³)		0.1	0.2	0.3	0.5	0.5	0.6	0.6	0.6	0.8	0.8	0.9	-	-
Tapped density (g/cm ³)		0.2	0.3	0.5	0.6	0.7	1.0	0.8	0.8	1.1	1.1	1.3	-	-
Elemental Analysis (ppm) ICP	Na	12	12	12						10	13		5	
	Si	20	8	20						5	22		15	
	Fe	4	4	4						5	6		3	
	Ca	2	2	2						4	4		3	
	K	20	16	20						15	11		-	

The here listed products provide a non-exhaustive overview of our current range – Feel free to contact us for more details.



> 3N α powders (jet milled -CR, ball milled -DBM, or special deagglomeration -MAR)

Baikalox® products (Typical values)		HP DBM	LSDBM	PB8 DBM	PB8 MAR**	PB20 CR
Specific Surface Area (m ² /g) BET		8	3	8	8	20
PSD (μm)	d ₅₀	0.4	1.2	0.3	0.4	2.6
Green density (g/cm ³) (Uniaxial pressing at 350 bar)		2.2	2.3	2.2	2.1	1.2
Fired density (g/cm ³) (Sintered at 1510°C for 2h)		3.95	3.80*	3.95	3.93	2.56
Linear Shrinkage (%)		17.5	15.4	18.5	18.8	23.4
Elemental Analysis (ppm) ICP	Na	30	175	43		
	Si	30	340	10		
	Fe	40	90	80		
	Ca	25	380	47		

*Sintered at 1620°C for 1.5h

** For special dispersion needs

The here listed products provide a non-exhaustive overview of our current range – Feel free to contact us for more details.

Applications

> Baikalex® alumina products are designed for:

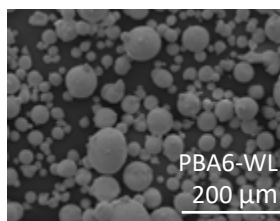
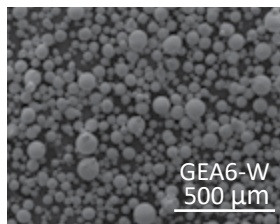
- **Thermal** conductivity
- **Dielectric** properties
- **Mechanical** properties, either as a filler in a matrix, or in a ready to use polishing slurry thanks to alumina intrinsic hardness
- **Optical** properties (visible & IR)
- **Sintering** properties with high reactivity at low temperature
- **Consistent** product quality for reproducible application performance



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> Examples of 4N α spray-dried alumina powders

Baikalox® products (Typical values)		GE9-W	GEA6-W	BA15-W
SSA (m ² /g)		12	8	17
PSD (μ m) laser diffraction d_{50}	Wet particles	0.18	0.2	0.12
	Dry granules	55	47	42
loss On Ignition (%)		0.8	0.8	1.3
Elemental Analysis (ppm) ICP	Na	17	10	20
	Si	25	25	5
	Fe	3.5	3.5	6
	Ca	1.5	1.4	2
	K	25	20	27



> Example of a α 3N RTP alumina powder

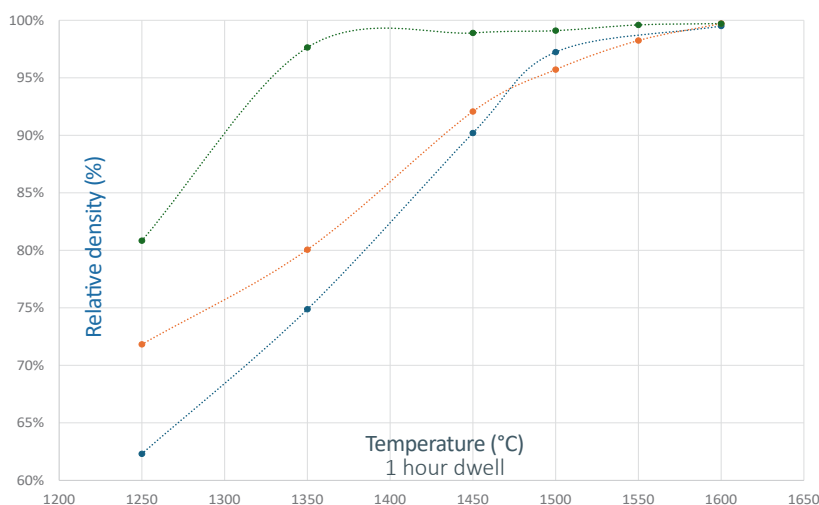
Baikalox® products (Typical values)		PBA6-WL*
SSA (m ² /g)		4
PSD (μ m) laser diffraction d_{50}	Wet particles	0.66
	Dry granules	55
loss On Ignition (%)		3.6
Elemental Analysis (ppm) ICP	Na	≤ 40
	Si	≤ 15
	Fe	≤ 75
	Ca	≤ 40
	K	≤ 10

*Sintering aid: 500 ppm MgO

The here listed products provide a non-exhaustive overview of our current range – Feel free to contact us for more details.

Spray-dried powders (**-W**) can also be supplied as Ready-To-Press grades incorporating a binder system (**-WL**). Doping options include 500 ppm MgO (**D2-W**), a combination of 500 ppm MgO and 500 ppm ZrO₂ (**D12-W**), or customized dopant additions upon request.

> Examples of relative density vs. temperature



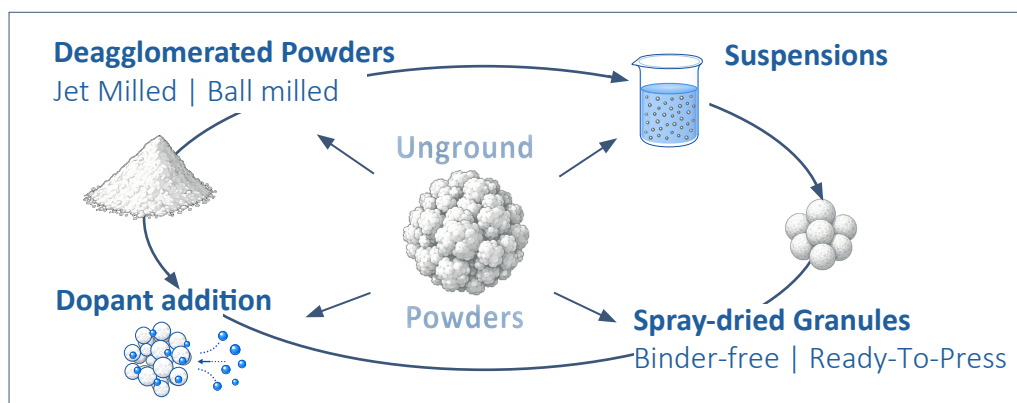
Baikalox® Powders

.....PBA6-WL

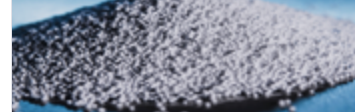
.....BMA15

.....CRA6

Customisation



PRODUCT DESIGN



Baikowski® can customize the physicochemical powder properties to meet your process and application needs. Contact us



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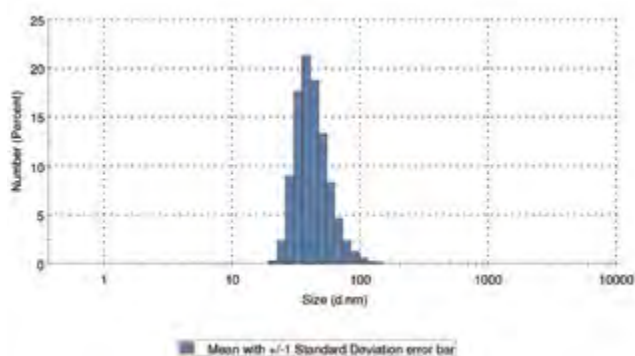
READY-TO-USE SOLUTIONS SLA | ALUMINA SLURRIES

Characteristics

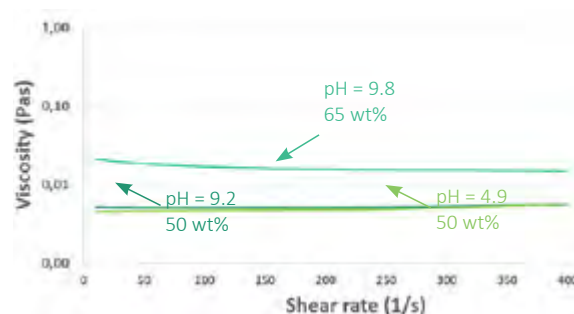
➤ SLA products are high purity alumina slurries featuring **submicronic particles**. The SLA range has the particularity to offer **customized** characteristics:

- Controlled particle size and size distribution
- pH (acidic or basic)
- Solid loading
- Viscosity
- Crystalline phase (α , γ)
- Chemical purity (3N, 4N and beyond)
- Specific surface area (wide range of SSA available)

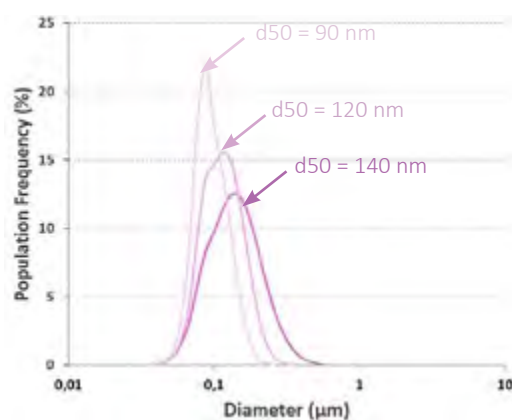
➤ Particle size distribution of a **gamma alumina slurry** (DLS)



➤ Example of viscosity curves for **alpha alumina slurries**



➤ Particle size distribution of **alpha slurries** (Horiba)



Applications

➤ Baikowski® is able to design fine alumina slurries upon request to match your application needs & process such as:

- Chemical compatibility (pH...)
- Viscosity
- Particle Size Distribution (PSD)
- Doping
- Crystalline phase



Any particular process issue? Looking for an acidic or basic slurry with low viscosity & high solid loading? Let us know your requirements and we will design, together, the best solution for your needs.



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SLA_z | BAIKALOX[®] ALUMINA SLURRIES & NANO-ZIRCONIA DOPING

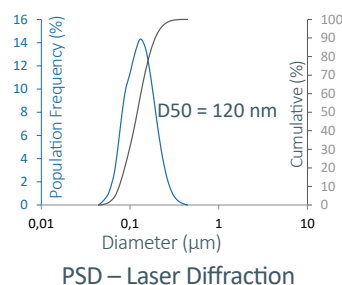
Characteristics

> SLA_z are tailor made slurries of high purity fine alpha alumina with nano-zirconia:

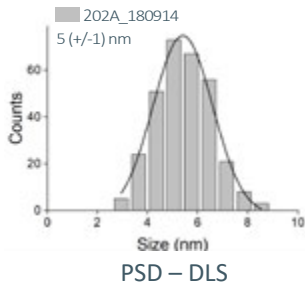
- Customized ratio of nano-zirconia in fine alpha alumina matrix
- Customized solid loading

***For specific uses, Baikowski[®] can provide ready-to-disperse powders*

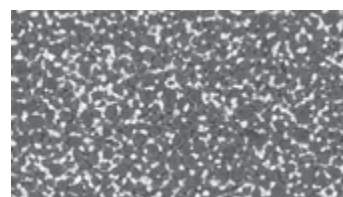
> Particle size distribution



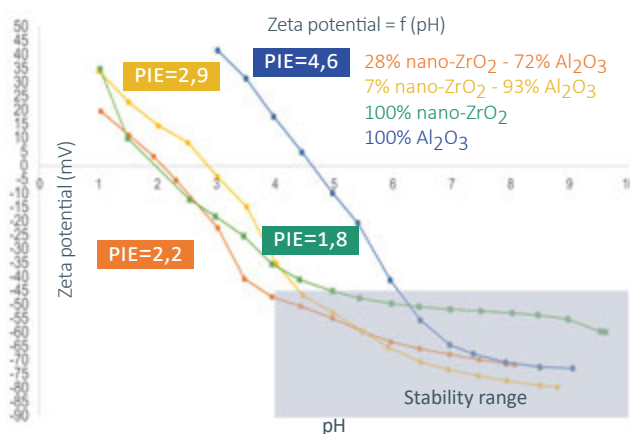
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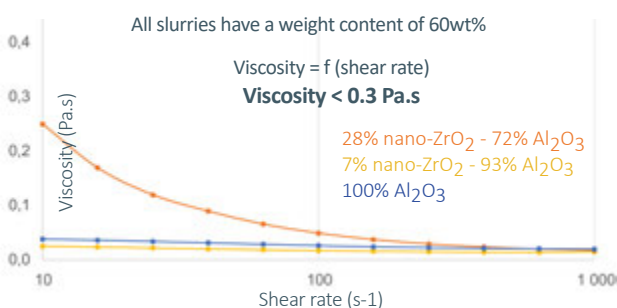
> Nano-Zirconia is homogeneously reparted into the alumina matrix



> The SLA_z slurries are stable on a large range of pH : from 4 to 10



> Low viscous slurries ($\eta < 0.3$ Pa.s) and small impact of the nano-ZrO₂ on the viscosity for slurry's processability.



Applications

> The SLA_z range highlights exceptional properties, especially for CMC applications.



PRODUCT DESIGN

Any technical challenges? Ask for a custom SLA_z slurry design that suits your process and application.





CMA[®] CONTROLLED MORPHOLOGY ALUMINA

Characteristics

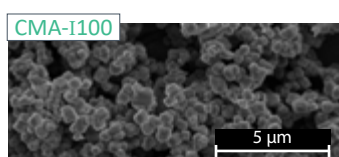
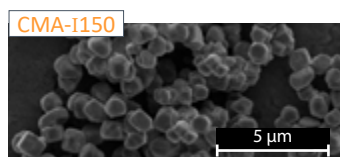
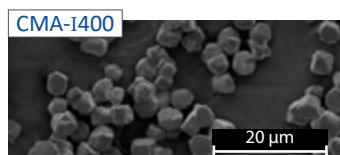
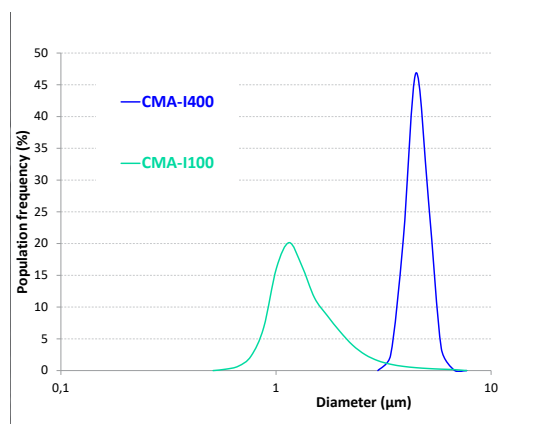
Standard CMA [®] products (Typical values)		CMA-I400	CMA-I200	CMA-I150	CMA-I100
Crystalline phase (%)		100% α			
Specific Surface Area (m ² /g) BET		0.7	1.8	2.0	3.1
PSD (μm)	d ₅₀	4.0	2.0	1.5	1.0
Bulk Density (g/cm ³)		1.0	0.7	0.6	0.6
Tapped Density (g/cm ³)		1.9	1.3	1.2	1.0
Elemental Analysis (ppm) ICP	Na	14	14	14	14
	Si	350	250	150	150
	Fe	4.0	4.0	4.0	4.0
	Ca	40	40	44	42
	K	15	15	15	15

> CMA[®] Controlled Morphology Alumina characteristics include all the Baikalox[®] specifications, plus:

- Shape and Morphology control: **Icosahedral form**
- Monomodal distribution
- Range of mean particle size from 0.5 to 5 μm
- High crystallinity
- Low viscosity



> Particle Size Distribution

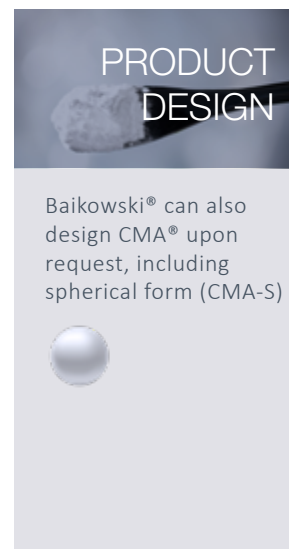


Applications

> CMA[®] range has a **high sintering reactivity at low temperature** thanks to its high tapped density, icosahedral form and its tight PSD.

It enables **maximized powder stacking** by reducing intergranular spaces.

Thus, **the porosity** of your ceramic parts and your coatings can be **well controlled**.



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READY-TO-USE SOLUTIONS

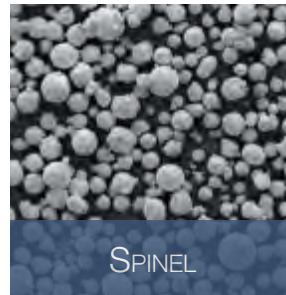
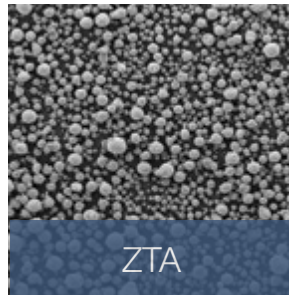
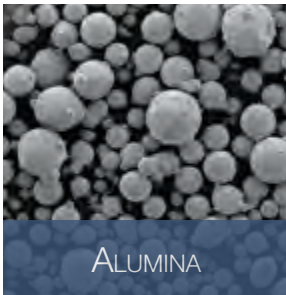
SPRAY-DRIED POWDERS

(including Ready-To-Press powders)

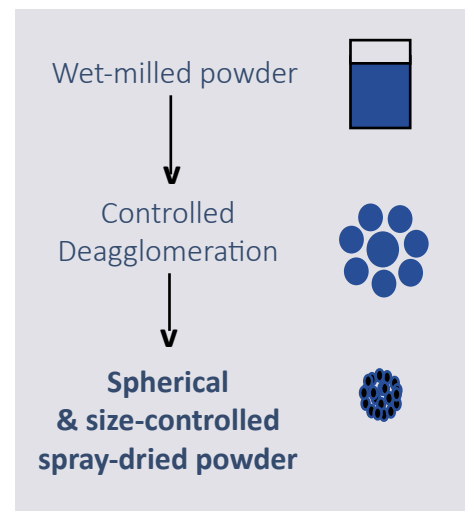
Characteristics

> Whatever your needs, we manufacture wet, jet and ball milled powders, as well as **spray-dried (binder free) and Ready-To-Press (RTP)** solutions for our main product ranges : **high purity alumina, ZTA/ATZ, zirconia, mullite and spinel.**

> Thanks to the very good **flowability** of these ready-to-use products, outstanding **sintered density parts** can be produced.

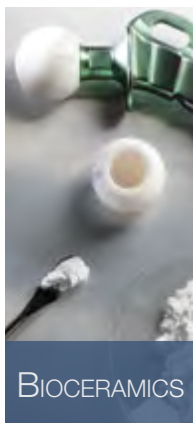


> Spray-drying process



Applications

> Spray-dried powders enable the design of **innovative materials** in many applications, including bioceramics, technical ceramics, injection molding, 3D printing, batteries and provide a perfect **consistency** of your final products.



Baikowski® can design custom spray-dried solutions that meet the physicochemical properties required for your application & process such as:

- Particle Size Distribution (PSD)
- Sinterability
- Flowability
- Optimized ceramic shaping behaviour
- Doping (mechanical reinforcement, coloring...)

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