

ALUMINA

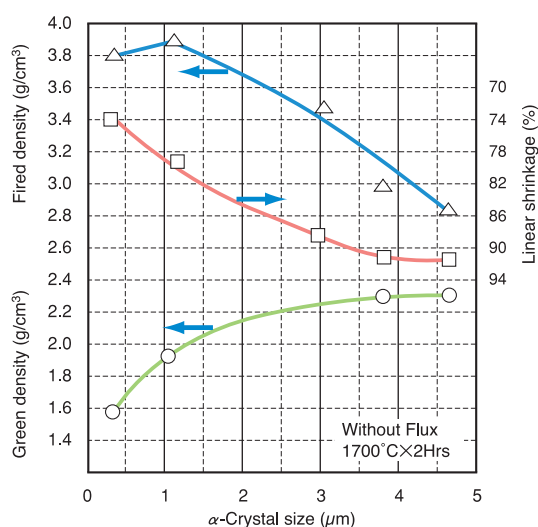
Alumina is a white crystalline powder produced by calcination of aluminum hydroxide. As the calcination temperature increases, it transforms through transitional crystal structures until reaching α (alpha) -alumina.

α -alumina is extremely stable chemically, with a high melting temperature. It exhibits superior mechanical strength and extreme hardness as well as high electric insulation and high thermal conductivity properties. As a result, our aluminas are widely used in ceramic materials such as electronic devices, mechanical parts, whiteware, fillers for resin as well as a key raw material for refractories and abrasives.

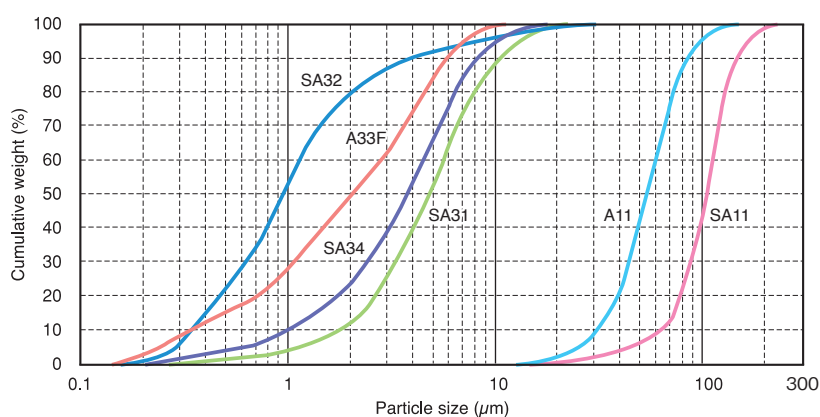
General Properties

Mohs Hardness.....	12
Specific Gravity.....	3.98
Melting Point	2,050°C
Thermal Conductivity	20~40W/mK
Volume Resistivity	$10^{12}\sim 10^{14}\Omega\cdot m$

α -Crystal Size vs. Sintering Properties



Particle Size Distribution

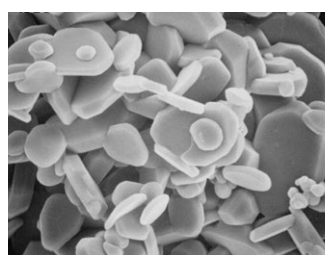
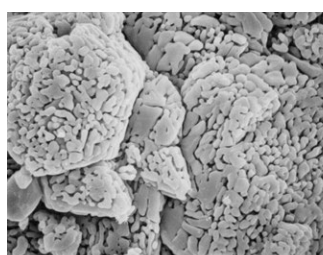
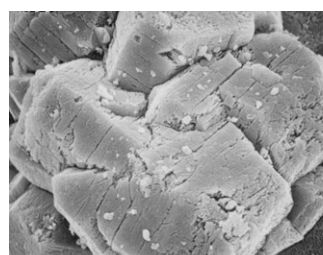
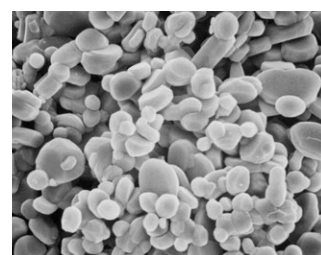


Regular/Coarse Grain Alumina

SA11/A11, alumina in a hexagonal crystalline form, is widely used as a raw material for refractories, abrasives and ceramics. Coarse grain SA12/A12 is an easily sintered alumina providing high firing density at a low temperature due to its small α -crystal size.

SA13/A13 is another fine α -crystal grain alumina with high reactivity suitable for polishing applications.

SA14/A14 has a relatively spherical crystalline form allowing high loading and so finds wide use as a raw material for refractories, ceramics and abrasives.

A11
10 μ mA12
10 μ mA13
10 μ mA14
10 μ m

Typical Properties

Grade	SA11	SA12	SA13	SA14	A11	A12	A13	A14
LOI (%)	0.01	0.01	0.07	0.01	0.01	0.02	0.06	0.01
Na ₂ O (%)	0.37	0.37	0.40	0.37	0.28	0.32	0.32	0.31
SiO ₂ (%)	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01
Fe ₂ O ₃ (%)	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Al ₂ O ₃ (%)	99.6	99.6	99.6	99.6	99.7	99.7	99.7	99.7
Ave. Particle Size (μ m)	110	110	110	110	55	55	55	55
α -Crystal Size (μ m)	4~7	1	—	3~7	4~5	<1	—	3~4
BET Specific Surface Area (m ² /g)	0.8	3.7	13	1.0	0.9	3.6	14	1.0
Bulk Density (Loose) (g/cm ³)	0.9	1.0	1.0	0.9	0.7	0.9	0.8	0.8
Bulk Density (Packed) (g/cm ³)	1.1	1.2	1.2	1.1	1.0	1.2	1.1	1.1
Angle of Repose (deg)	38	34	32	35	47	38	38	50

Applications

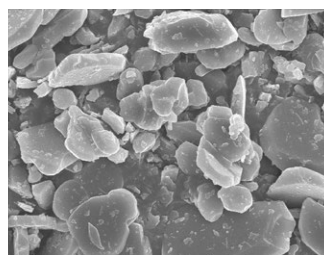
- (1) Glasses (including FPD glass substrates)
- (2) Tabular alumina, Fused alumina
- (3) Spinel
- (4) Ceramics
- (5) Refractory bricks, Castables
- (6) Abrasives, Polisher
- (7) Mold releasing agent

Packing

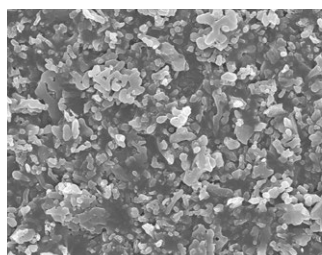
- Flexible container bag (500kg and 1000kg)
Paper bag (25kg)

Milled Alumina SA30 Series

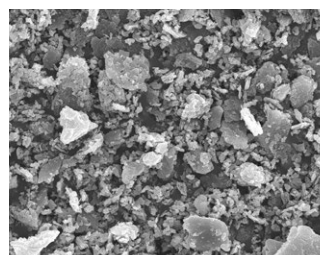
SA30 series is ground regular grain aluminas, predominantly α -crystal, widely used as raw materials for ceramics and refractories. A33F is mainly used in polishing applications.



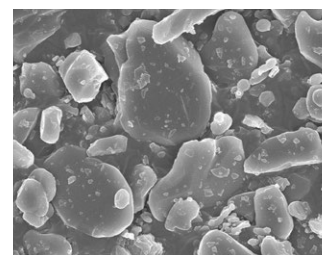
SA31



SA32



A33F



SA34

Typical Properties

Grade	SA31	SA31B	SA32	A33F	SA34
LOI (%)	0.02	0.03	0.03	0.12	0.02
Na ₂ O (%)	0.36	0.36	0.37	0.32	0.37
SiO ₂ (%)	0.03	0.03	0.02	0.01	0.03
Fe ₂ O ₃ (%)	0.02	0.02	0.02	0.02	0.02
Al ₂ O ₃ (%)	99.6	99.6	99.6	99.6	99.6
Ave. Particle Size (µm)	6.0	4.6	1.3	2.9	4.8
α -Crystal Size (µm)	4~7	4~7	1	—	3~7
BET Specific Surface Area (m ² /g)	1.2	1.7	4.5	17	1.9
Bulk Density (Loose) (g/cm ³)	0.9	0.9	0.6	0.4	0.9
Bulk Density (Packed) (g/cm ³)	1.3	1.3	1.1	0.6	1.2
Water Absorption (mℓ/100g)	21	15	24	34	19
pH	10	10	10	10	10
Bulk Density (Pressed) (g/cm ³) [*]	2.36	2.36	2.02	1.58	2.32
Green Density (g/cm ³)	2.31	2.38	1.89	1.57	2.27
Fired Density (g/cm ³) ^{**}	3.01	3.37	3.55	3.80	3.09
Linear Shrinkage (%) ^{**}	7.5	10.2	18.1	24.5	8.7

^{*}Pressed at 98.07MPa{1000kgf/cm²} ^{**}Without flux, Pressed at 98.07MPa{1000kgf/cm²}, Fired at 1700°C for 2hrs

Applications

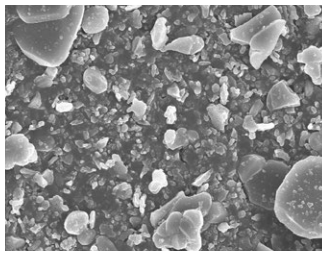
- (1) High alumina brick, Refractory binder
- (2) Castables
- (3) Spinel
- (4) Alumina ceramics
- (5) Abrasives, Polisher

Packing

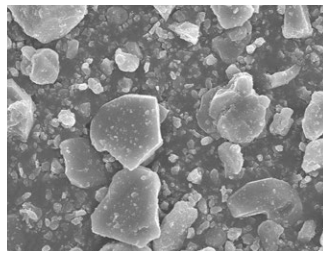
- Flexible container bag (500kg and 1000kg)
Paper bag (25kg)

Milled Alumina A40 Series/SMM Series

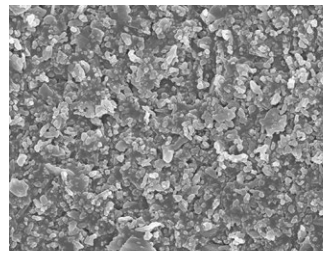
SA40 and SMM series are products with controlled particle size distribution to suit desired slurry and sintering characteristics. MM-P is mainly used in polishing applications.



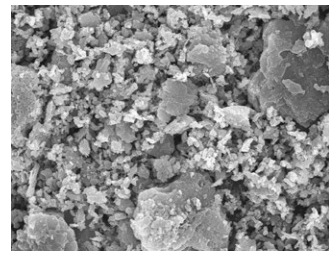
SA41A



SA43A



SMM-22



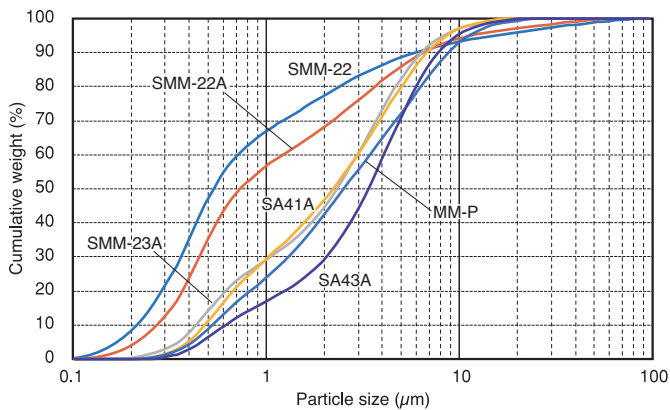
MM-P

Typical Properties

Grade	SA41A	SA43A	SMM-22	SMM-22A	SMM-23A	SMM-24A	MM-P
LOI (%)	0.04	0.03	0.07	0.06	0.08	0.07	0.09
Na ₂ O (%)	0.36	0.35	0.37	0.37	0.38	0.35	0.29
SiO ₂ (%)	0.03	0.03	0.02	0.02	0.03	0.03	0.09
Fe ₂ O ₃ (%)	0.02	0.02	0.03	0.03	0.04	0.05	0.02
Al ₂ O ₃ (%)	99.6	99.6	99.6	99.6	99.6	99.6	99.6
Ave. Particle Size (µm)	2.1	3.9	0.6	0.7	2.4	2.3	2.4
BET Specific Surface Area (m ² /g)	3.4	2.3	6.3	6.0	4.2	2.5	11
Water Absorption (ml / 100g)	17	18	24	21	15	16	27
pH	10	10	10	11	11	11	10
Bulk Density (Pressed) (g/cm ³)*	2.45	2.48	2.04	2.23	2.50	2.50	1.68

*Pressed at 98.07MPa(1000kgf/cm²)

Particle Size Distribution



Applications

- (1) High alumina brick, Refractory binder
- (2) Castables
- (3) Abrasives, Polisher

Packing

Flexible container bag (500kg and 1000kg)
Paper bag (15kg/20kg/25kg)

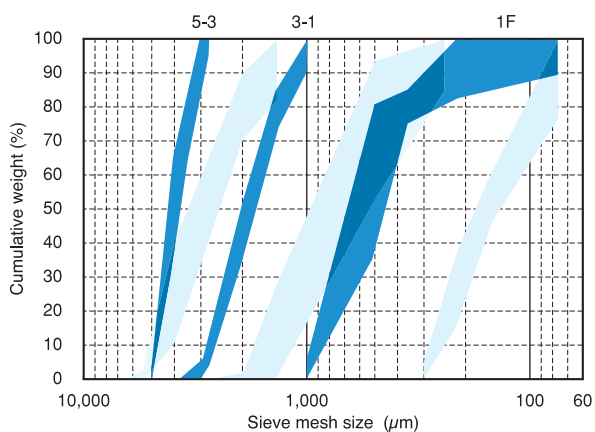
WHITE FUSED ALUMINA

NIKKEI RUNDUM is high quality white fused alumina (WA). It is produced by melting high quality alumina in an electric furnace and then solidifying. It is crushed and ground into powder with carefully controlled grain sizes. It has high hardness and melting point and is very stable at room temperature. It is impervious to acids and alkalis. NIKKEI RUNDUM is suitable for refractories and grinding materials.

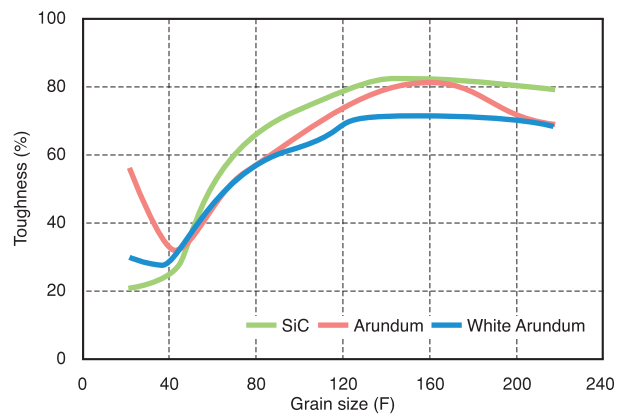
General Properties

Mohs Hardness	12
Knoop Hardness (Hk100)	2,050
Melting Point	2,050°C

Grain Size Distribution



Type of Abrasives vs. Toughness

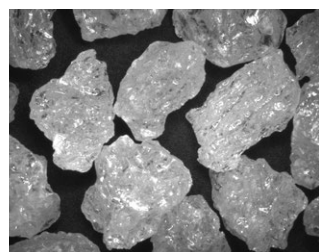


Source: JIS R6128 (1975)
Guide for Toughness Test Method for Artificial Abrasives

White Fused Alumina for Refractory NIKKEI RUNDUM G1

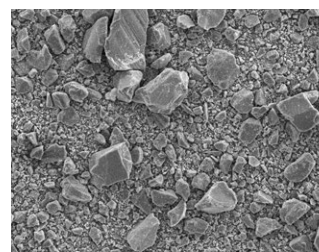
NIKKEI RUNDUM G1, with its high mechanical strength, hardness and chemical stability, is ideal for refractory bricks and castables which require abrasion and corrosion resistance.

NR is the fine-ground equivalent of G1.



3-1mm

1mm



NR325F

100µm

Typical Properties

	Specific Gravity	Bulk Density(Loose) (g/cm ³)	Bulk Density(Packed) (g/cm ³)	Color	Porosity (%)	Magnetic Substances (ppm)
G1 (3-1mm)	3.96	1.75	1.96	White	6.6	8
G1 (NR325F)	3.96	1.02	1.98	Whitesmoke	—	12

Grain Size	Chemical Composition					Grain Size Distribution			
	Al ₂ O ₃ (%)	Fe ₂ O ₃ (%)	SiO ₂ (%)	Na ₂ O (%)	H ₂ O (%)				
30-10	≥99.0	≤0.1	≤0.1	≤0.4		+30.0	30.0~10.0	-10	
	99.7	0.02	0.05	0.26	0.01	≤5		≤10	
						0	95.8	4.2	
5-3	≥99.0	≤0.1	≤0.1	≤0.4		+5.0	5.0~3.0	-3	
	99.7	0.01	0.05	0.22	0.01	≤5		≤10	
						1.4	92.5	6.1	
3-1	≥99.0	≤0.1	≤0.1	≤0.4		+3.0	3.0~1.0	-1	
	99.7	0.02	0.05	0.18	0.01	≤5		≤10	
						1.1	95.6	3.3	
1F	≥99.0	≤0.1	≤0.1	≤0.4		+1.0	1.0~0.5	0.5~0.212	-0.212
	99.7	0.02	0.05	0.16	0.01	≤5			
						1.5	55	36.8	6.7
						+0.3	0.3~0.075	-0.075	
0.3F	≥99.0	≤0.1	≤0.1	≤0.6		≤5			
	99.5	0.03	0.05	0.42	0.01	2.2	86.3	11.5	
NR325F	≥99.0	≤0.2	≤0.2	≤0.4	≤0.3	-0.045 (Wet)			
	99.7	0.03	0.05	0.19	0.11	≥95			
						97.8			

Upper: Standard Specifications (%)
Lower: Typical Values (%)

Upper: Sieve Mesh Size (mm)
Middle: Standard Specifications (%)
Lower: Typical Values (%)

* Other grain sizes are available upon request

Applications

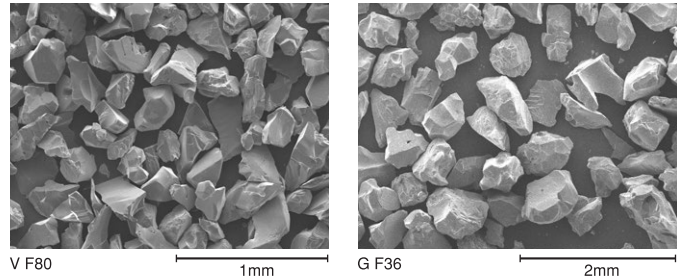
- (1) Refractory bricks
- (2) Castables

Packing

- Flexible container bag (500kg and 1000kg)
Paper bag (25kg)

White Fused Alumina for Grinding NIKKEI RUNDUM V/G

NIKKEI RUNDUM V/G has excellent strength and toughness which allows it to be used in a wide range of applications, from general to precision grinding. V is suitable for vitrified grinding wheels and G is often used for resinoid grinding wheels.



Typical Properties

	Specific Gravity	Bulk Density (g/cm ³)	Toughness (%)	Magnetic Substances (ppm)	pH
V (F80)	3.96	1.75	60	1	7.6
G (F36)	3.96	1.78	33	6	8.7

Grain Size	Chemical Composition (%)	Al ₂ O ₃		Na ₂ O		Fe ₂ O ₃		SiO ₂		LOI	
		Std. Spec.	Typical	Std. Spec.	Typical	Std. Spec.	Typical	Std. Spec.	Typical	Std. Spec.	Typical
V	F24~F36	≥99.5	99.8	≤0.13	0.09	≤0.05	0.01	≤0.12	0.09	≤0.05	0.01
	F46~F80	≥99.5	99.8	≤0.13	0.09	≤0.05	0.02	≤0.12	0.09	≤0.05	0.01
	F90~F120	≥99.5	99.7	≤0.17	0.13	≤0.05	0.03	≤0.13	0.09	≤0.05	0.01
	F150~F220	≥99.0	99.6	≤0.30	0.26	≤0.05	0.03	≤0.15	0.11	≤0.05	0.01
G	F10~F20	≥99.5	99.8	≤0.30	0.15	≤0.05	0.01	≤0.10	0.03	≤0.05	0.01
	F24~F36	≥99.5	99.8	≤0.30	0.16	≤0.05	0.01	≤0.10	0.03	≤0.05	0.01
	F46~F60	≥99.5	99.7	≤0.30	0.21	≤0.05	0.02	≤0.10	0.03	≤0.05	0.01

Applications

V: Vitrified grinding wheels, Setter, Thermal spray material, Casting sand, Fillers

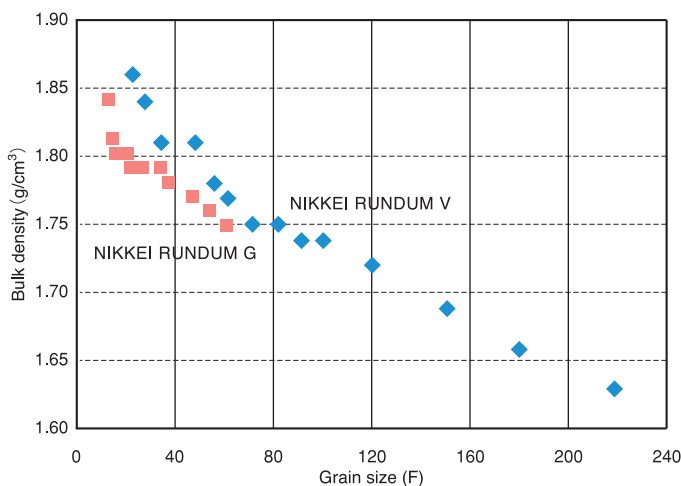
G: Resinoid grinding wheels, Blast, Non-slip materials, Abrasive cloth/paper

Packing

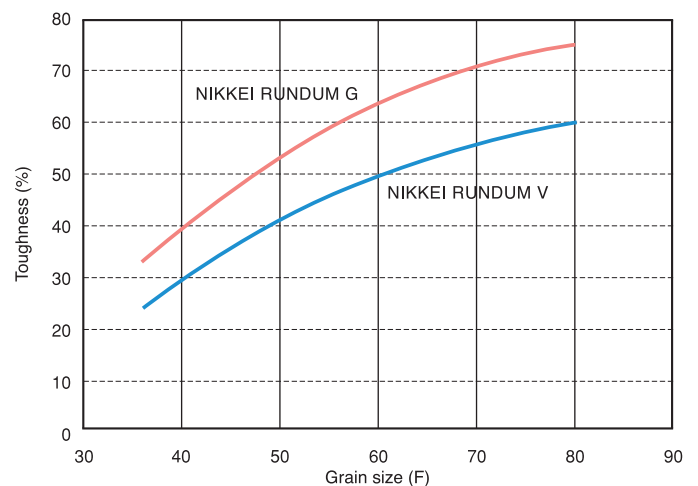
Flexible container bag (500kg and 1000kg)

Paper bag (20kg)

Bulk Density



Toughness



Grain Size	Grain Size Distribution															Bulk Density (g/cm ³) Std. Spec.	Typical
	Sieve Mesh Size (μm)	Std. Spec. (%) (Plus sieve)	Sieve Mesh Size (μm)	Std. Spec. (%)	Typical (%)	Sieve Mesh Size (μm)	Std. Spec. (%)	Typical (%)	Sieve Mesh Size (μm)	Std. Spec. (%)	Typical (%)	Sieve Mesh Size (μm)	Std. Spec. (%) (Minus sieve)	Typical (%)			
V	F24	1180	0	1180~850	≤25	15	850~710	≥45	62	850~600	≥65	81	500	≤3	0	1.80~1.94	1.86
	F30	1000	0	1000~710	≤25	13	710~600	≥45	60	710~500	≥65	85	425	≤3	0	1.76~1.90	1.84
	F36	850	0	850~600	≤25	7	600~500	≥45	57	600~425	≥65	88	355	≤3	0	1.72~1.86	1.81
	F46	600	0	600~425	≤30	20	425~355	≥40	48	425~300	≥65	76	250	≤3	0	1.72~1.86	1.81
	F54	500	0	500~355	≤30	7	355~300	≥40	50	355~250	≥65	88	212	≤3	1	1.71~1.85	1.78
	F60	425	0	425~300	≤30	9	300~250	≥40	54	300~212	≥65	88	180	≤3	0	1.71~1.85	1.77
	F70	355	0	355~250	≤25	20	250~212	≥40	50	250~180	≥65	75	150	≤3	1	1.66~1.80	1.75
	F80	300	0	300~212	≤25	19	212~180	≥40	46	212~150	≥65	77	125	≤3	0	1.66~1.80	1.75
	F90	250	0	250~180	≤20	6	180~150	≥40	45	180~125	≥65	91	106	≤3	1	1.60~1.80	1.74
	F100	212	0	212~150	≤20	9	150~125	≥40	58	150~106	≥65	86	75	≤3	0	1.60~1.80	1.74
	F120	180	0	180~125	≤20	12	125~106	≥40	42	125~90	≥65	86	63	≤3	0	1.60~1.80	1.72
	F150	150	0	150~106	≤15	4	106~75	≥40	57	106~63	≥65	88	45	≤3	1	1.55~1.75	1.69
	F180	125	0	125~90	≤15	3	90~63	≥40	48	90~53	≥65	72	53	≤35	25	1.55~1.75	1.66
	F220	106	0	106~75	≤15	2	75~53	≥40	48	75~45	≥60	77	45	≤40	21	1.55~1.75	1.63
	G	F10	3350	0	3350~2360	≤20	17	2360~2000	≥45	55	2360~1700	≥70	79	1400	≤3	0	1.75~1.91
F12		2800	0	2800~2000	≤20	3	2000~1700	≥45	50	2000~1400	≥70	94	1180	≤3	0	1.75~1.91	1.81
F14		2360	0	2360~1700	≤20	17	1700~1400	≥45	68	1700~1180	≥70	82	1000	≤3	0	1.75~1.91	1.80
F16		2000	0	2000~1400	≤20	5	1400~1180	≥45	55	1400~1000	≥70	93	850	≤3	0	1.75~1.91	1.80
F20		1700	0	1700~1180	≤20	4	1180~1000	≥45	54	1180~850	≥70	92	710	≤3	0	1.75~1.91	1.79
F24		1180	0	1180~850	≤25	16	850~710	≥45	62	850~600	≥65	81	500	≤3	0	1.74~1.90	1.79
F30		1000	0	1000~710	≤25	12	710~600	≥45	59	710~500	≥65	86	425	≤3	0	1.73~1.89	1.79
F36		850	0	850~600	≤25	6	600~500	≥45	54	600~425	≥65	82	355	≤3	0	1.72~1.88	1.78
F46		600	0	600~425	≤30	11	425~355	≥40	49	425~300	≥65	87	250	≤3	0	1.71~1.87	1.77
F60	425	0	425~300	≤30	23	300~250	≥40	55	300~212	≥65	75	180	≤3	0	1.71~1.83	1.75	

* Other grain sizes are available upon request

Main Methods of Product Analysis

		ALUMINUM HYDROXIDE	ALUMINA	WHITE FUSED ALUMINA
Chemical Analysis	H ₂ O (%)	Karl Fischer titration method*		Loss of mass by drying at 300±10°C
	LOI (%)	Loss of mass by ignition at 1100±25°C		
	SiO ₂ (%)	Fluorescent X-ray method		
	Fe ₂ O ₃ (%)	Fluorescent X-ray method		
	Na ₂ O (%)	Fluorescent X-ray method		
	f-Na ₂ O (%)	Hot-water elution - Atomic absorption spectroscopy	-	-
	Al ₂ O ₃ , Al(OH) (%)	100-(SiO ₂ +Fe ₂ O ₃ +Na ₂ O)		100-(SiO ₂ +Fe ₂ O ₃ +Na ₂ O+LOI)
Physical Analysis	Ave. Particle Size (μm)	Laser diffraction scattering** or Sieve analysis		Sieve analysis
	Bulk Density (g/cm ³)	Untamped density and tamped density		
	Bulk Density (Pressed) (g/cm ³)	-	Press forming - Bulk density measurement	-
	Angle of Repose (deg)	Gravity method		-
	BET Specific Surface Area (m ² /g)	Nitrogen gas adsorption		-
	Oil Absorption (mL/100g)	DOP spatula kneading method		-
	Water Absorption (mL/100g)	-	Distilled water spatula kneading method	-
	pH	Water extraction - Glass electrode measurement	-	Water extraction - Glass electrode measurement
	Whiteness (%)	Spectrocolorimeter		-
	Electric Conductivity (mS/m)	Water extraction - Electric conductivity measurement		-
	α-Crystal Size (μm)	-	Measurement by electron microscope	-
	Green Density (g/cm ³)	-	Press forming (with flux) - Bulk density measurement	-
	Fired Density (g/cm ³)	-	Press forming (with flux) - Sintering - Density measurement by water displacement	-
	Toughness (%)	-	-	Ball mill test
	Specific Gravity	-	-	Suspension method
Magnetic Substances (ppm)	-	-	Magnetic collection	
Porosity (%)	-	-	Water absorption method	

* Loss of mass by drying at 110±5°C may be used instead. ** Microtrac particle size distribution analyzer