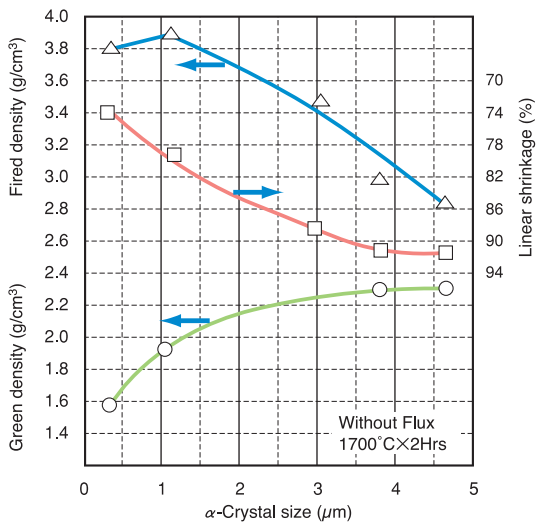
ALUMINA

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.

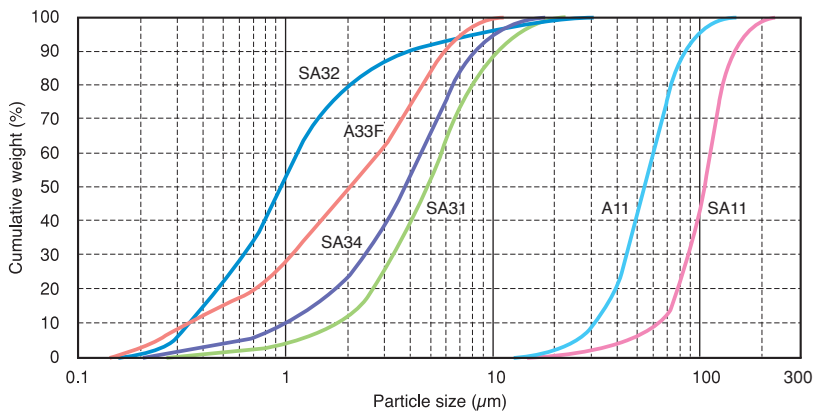
General Properties

Mohs Hardness	12
Specific Gravity	3.98
Melting Point	2,050˚C
Thermal Conductivity	20～40W/mK
Volume Resistivity	10^{12}～10^{14}Ω-m

α-Crystal Size vs. Sintering Properties



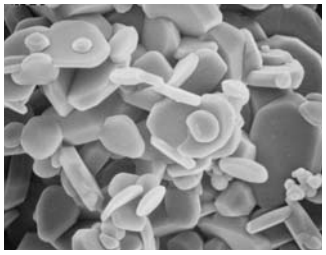
Particle Size Distribution

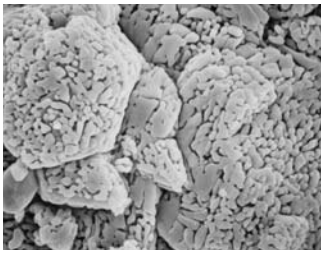


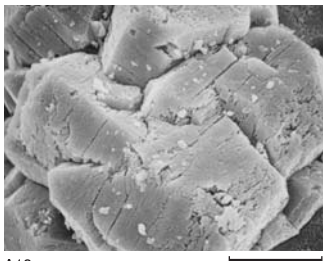
Regular/Coarse Grain Alumina

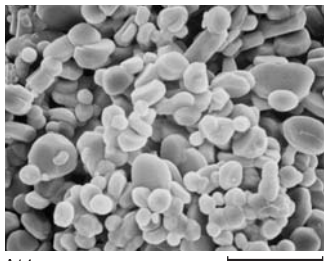
SA11/A11, alumina in a hexagonal crystalline form, is widely used as a raw material for refractories, abrasives and ceramics. Coarse grain SA12/A12 is an easily sintered alumina providing high firing density at a low temperature due to its small α-crystal size.

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 10μm


A12 10μm


A13 10μm


A14 10μm

Typical Properties

Grade	SA11	SA12	SA13	SA14	A11	A12	A13	A14
LOI (%)	0.01	0.02	0.09	0.02	0.01	0.02	0.12	0.01
Na_2O (%)	0.37	0.37	0.40	0.37	0.30	0.30	0.30	0.30
SiO_2 (%)	0.03	0.03	0.03	0.03	0.02	0.02	0.02	0.02
Fe_2O_3 (%)	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Al_2O_3 (%)	99.6	99.6	99.6	99.6	99.7	99.7	99.7	99.7
Ave. Particle Size (μm)	105	105	105	105	55	55	55	55
α-Crystal Size (μm)	4～7	1	—	3～7	4～5	＜1	—	3～4
BET Specific Surface Area (m^2/g)	0.8	3.9	15	1.0	1.1	3.5	15	1.2
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	48	38	38	50

Applications

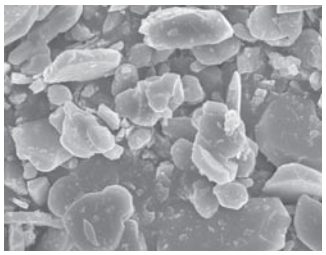
(1) Glasses (including FPD glass substrates)
(2) Tabular alumina, Fused alumina
(3) Spinel
(4) Ceramics
(5) Refractory bricks, Castables
(6) Abrasives, Polisher
(7) Mold releasing agent

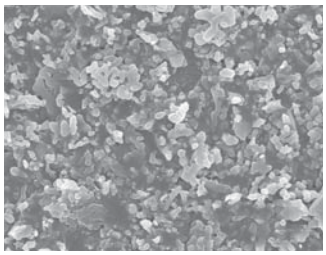
Packing

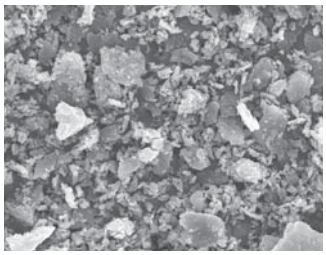
Bulk
Flexible container bag (500kg and 1000kg)
Paper bag (25kg)

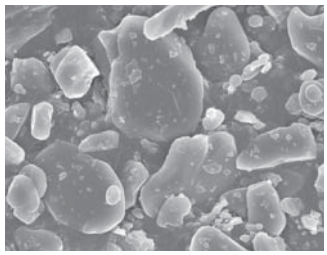
Milled Alumina SA30 Series

SA30 series are ground regular grain aluminas, predominantly α-crystal, widely used as raw materials for ceramics and refractories.


SA31 10μm


SA32 10μm


A33F 10μm


SA34 10μm

Typical Properties

Grade	SA31	SA31B	SA32	A33F	SA34
LOI (%)	0.02	0.03	0.03	0.17	0.02
Na_2O (%)	0.37	0.37	0.37	0.26	0.37
SiO_2 (%)	0.03	0.03	0.03	0.02	0.03
Fe_2O_3 (%)	0.02	0.02	0.02	0.02	0.02
Al_2O_3 (%)	99.6	99.6	99.6	99.7	99.6
Ave. Particle Size (μm)	5	4	1	2	4
α-Crystal Size (μm)	4～7	4～7	1	—	3～7
BET Specific Surface Area (m^2/g)	1.3	1.8	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	1.3
Water Absorption (mℓ/100g)	21	15	22	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 Shinkage (%)**	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

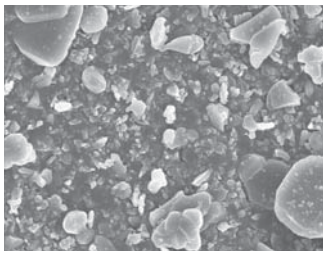
(1) High alumina brick, Refractory binder
(2) Castables
(3) Spinel
(4) Alumina ceramics
(5) Abrasives, Polisher

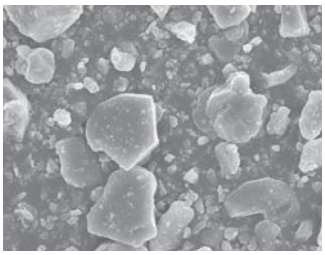
Packing

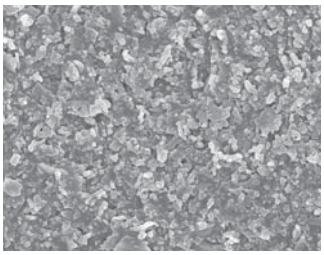
Flexible container bag (500kg and 1000kg)
Paper bag (25kg)

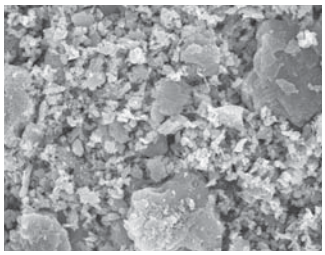
Milled Alumina SA40 Series/SMM Series

SA40 series and SMM are products with controlled particle size distribution and soda content to suit desired slurry and sintering characteristics.


SA41A 10μm


SA43A 10μm


SMM-22 10μm

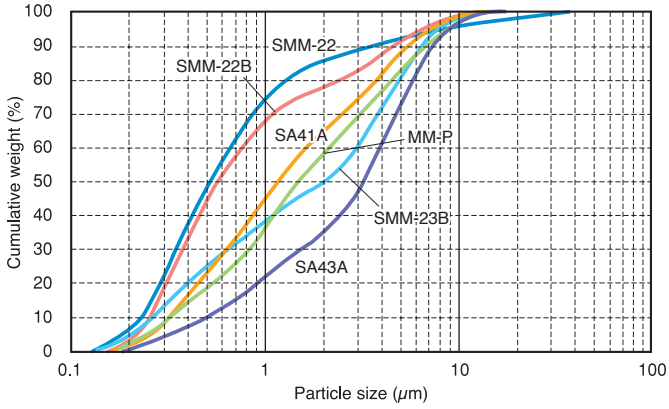

MM-P 10μm

Typical Properties

Grade	SA41A	SA43A	SMM-22	SMM-22B	SMM-23B	SMM-24B	MM-P
LOI (%)	0.05	0.04	0.08	0.07	0.06	0.06	0.10
Na_2O (%)	0.37	0.37	0.38	0.26	0.28	0.30	0.30
SiO_2 (%)	0.03	0.03	0.03	0.03	0.03	0.03	0.02
Fe_2O_3 (%)	0.02	0.02	0.03	0.03	0.04	0.03	0.02
Al_2O_3 (%)	99.6	99.6	99.6	99.6	99.6	99.6	99.7
Ave. Particle Size (μm)	1.2	3.2	0.5	0.6	2.0	1.9	1.5
BET Specific Surface Area (m^2/g)	3.7	2.5	7.1	5.3	3.8	3.6	10
Water Absorption (mℓ/100g)	17	18	24	21	15	16	27
pH	10	10	10	10	11	11	10
Bulk Density (Pressed) (g/cm^3)*	2.45	2.48	2.04	2.18	2.52	2.49	1.72

*Pressed at 98.07MPa{1000kgf/cm^2}

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)

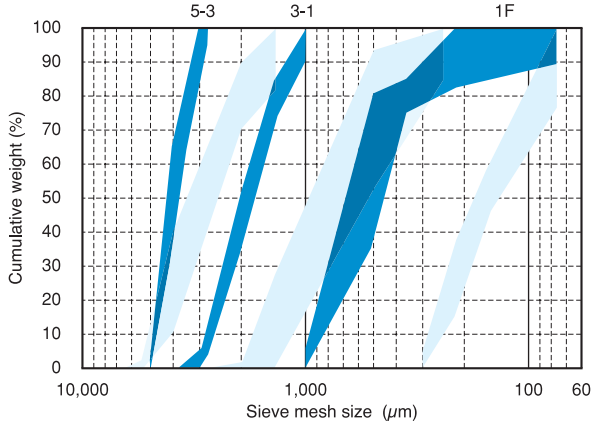
WHITE FUSED ALUMINA

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.

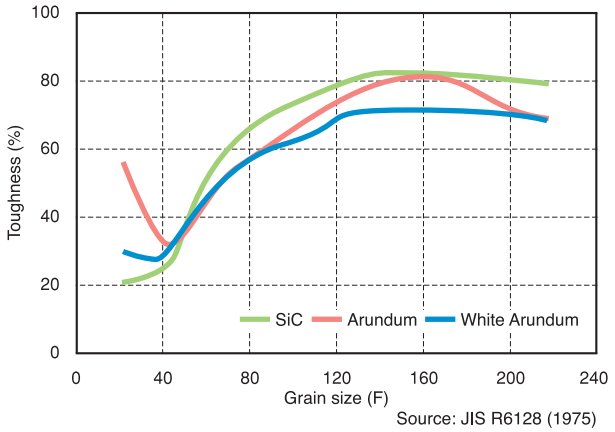
General Properties

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

Grain Size Distribution



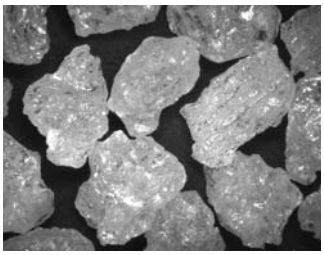
Type of Abrasives vs. Toughness



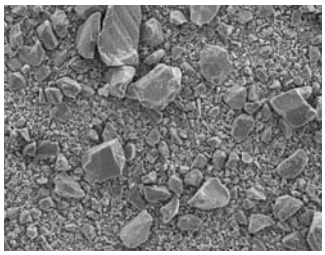
Source: JIS R6128 (1975)
Guide for Toughness Test Method for Artificial Abrasives

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/cm³)	Bulk Density(Packed) (g/cm³)	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	Al_2O_3 (%)	Fe_2O_3 (%)	SiO_2 (%)	Na_2O (%)	H_2O (%)
30-10	≧99.0 99.7	≦0.1 0.02	≦0.1 0.05	≦0.4 0.26	0.01
5-3	≧99.0 99.7	≦0.1 0.01	≦0.1 0.05	≦0.4 0.22	0.01
3-1	≧99.0 99.7	≦0.1 0.02	≦0.1 0.05	≦0.4 0.18	0.01
1F	≧99.0 99.7	≦0.1 0.02	≦0.1 0.05	≦0.4 0.16	
0.3F	≧99.0 99.5	≦0.1 0.03	≦0.1 0.05	≦0.6 0.42	0.01
NR325F	≧99.0 99.7	≦0.2 0.03	≦0.2 0.05	≦0.4 0.19	≦0.3 0.11

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

* Other grain sizes are available upon request

Grain Size Distribution			
+30.0 ≦5 0	30.0~10.0 95.8	-10 ≦10 4.2	
+5.0 ≦5 1.4	5.0~3.0 92.5	-3 ≦10 6.1	
+3.0 ≦5 1.1	3.0~1.0 95.6	-1 ≦10 3.3	
+1.0 ≦5 1.5	1.0~0.5 55	0.5~0.212 36.8	-0.212 6.7
+0.3 ≦5 2.2	0.3~0.075 86.3	-0.075 11.5	
-0.045 (Wet) ≧95 97.8			

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

Applications

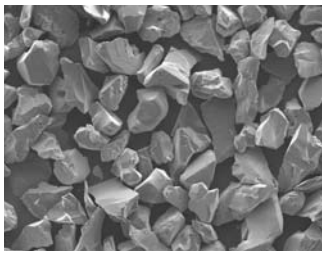
(1) Refractory bricks
(2) Castables

Packing

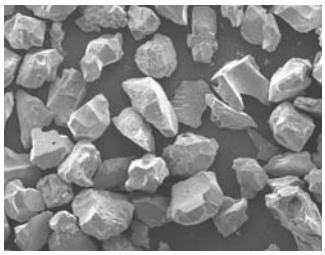
Flexible container bag (500kg and 1000kg)
Paper bag (25kg)

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.



V F80 1mm



G F36 2mm

Typical Properties

	Specific Gravity	Bulk Density (g/cm³)	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_2O_3 Std. Spec.	Al_2O_3 Typical	Na_2O Std. Spec.	Na_2O Typical	Fe_2O_3 Std. Spec.	Fe_2O_3 Typical	SiO_2 Std. Spec.	SiO_2 Typical	LOI Std. Spec.	LOI 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

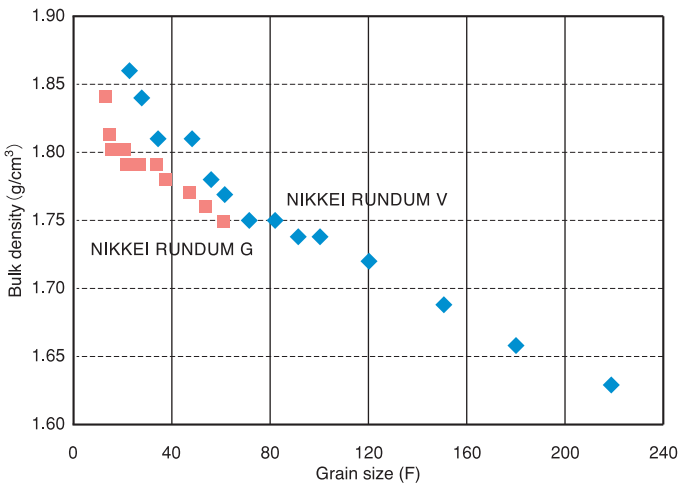
Applications

V: Vitrified grinding wheels, Setter, Thermal spray material, Casting sand, Fillers
G: Resinoid grinding wheels, Blast, Non-slip materials, Abrasive cloth/paper

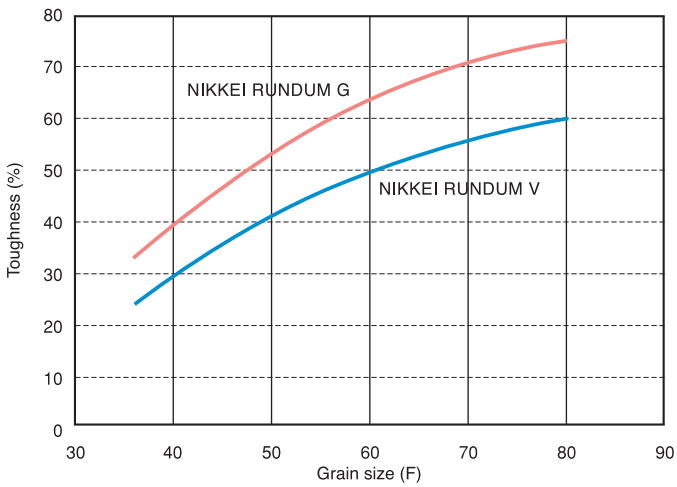
Packing

Flexible container bag (500kg and 1000kg)
Paper bag (20kg)

Bulk Density



Toughness



Grain Size		Grain Size Distribution														Bulk Density (g/cm³) 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	1.84
	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

Methods of Product Analysis

		ALUMINUM HYDROXIDE	ALUMINA	WHITE FUSED ALUMINA
Chemical Analysis	H_2O(%)	Loss of mass by drying at 110±5℃ (JIS R 9301-3-1, 1999)	Loss of mass by drying at 300±10℃ (JIS R 9301-3-1, 1999)	
	LOI(%)	Loss of mass by ignition at 1100±25℃ (JIS R 9301-3-2, 1999)		
	SiO_2(%)	Molybdenum blue colorimetry or ICP emission spectroscopy (JIS R 9301-3-5, 1999)*		
	Fe_2O_3(%)	1,10-phenanthroline colorimetry or ICP emission spectroscopy (JIS R 9301-3-6, 1999)*		
	Na_2O(%)	Lithium carbonate/Boric acid melting - Atomic absorption spectroscopy (JIS R 9301-3-9, 1999)*		
	f-Na_2O(%)	Hot-water elution - Atomic absorption spectroscopy	–	–
	Al_2O_3, Al(OH)(%)	100-(SiO_2+Fe_2O_3+Na_2O)		100-(SiO_2+Fe_2O_3+Na_2O+LOI)
Physical Analysis	Ave. Particle Size(μm)	Laser diffraction scattering** or Sieve analysis		Sieve analysis
	Bulk Density(g/cm³)	Untamped density and tamped density (JIS R 9301-2-3, 1999)		
	Bulk Density (Pressed)(g/cm³)	–	Press forming - Bulk density measurement	–
	Angle of Repose(deg)	Gravity method (JIS R 9301-2-2, 1999)		–
	BET Specific Surface Area(m²/g)	Nitrogen gas adsorption		–
	Oil Absorption(mℓ/100g)	DOP spatula kneading method (JIS K 5101-13-1, 2004)	–	–
	Water Absorption(mℓ/100g)	–	Distilled water spatula kneading method (JIS K 5101-13-1, 2004)	–
	pH	Water extraction - Glass electrode measurement (JIS Z 8802, 1984)	–	Water extraction - Glass electrode measurement (JIS Z 8802, 1984)
	Whiteness(%)	Spectrocolorimeter		–
	Electric Conductivity(mS/m)	Water extraction - Electric conductivity measurement	–	–
	α-Crystal Size(μm)	–	Measurement by electron microscope	–
	Green Density(g/cm³)	–	Press forming (with flux) - Bulk density measurement	–
	Fired Density(g/cm³)	–	Press forming (with flux) - Sintering - Density measurement by water displacement	–
	Toughness(%)	–	–	Ball mill test (JIS R 6128, 1975 (abolished in 1999))
	Specific Gravity	–	–	Suspension method (JIS R 6004, 2005)
	Magnetic Substances(ppm)	–	–	Magnetic collection
	Porosity(%)	–	–	Water absorption method (JIS C 2141, 1992)

*Fluorescent X-ray method may be used instead. **Microtrac particle size distribution analyzer 9320HRA