



SUMITOMO CHEMICAL

Creative Hybrid Chemistry  
For a Better Tomorrow

# Product Databook

- Aluminium Hydroxide*
- Aluminium Oxide (Alumina)*
- High Purity Alumina (HPA)*
- Activated Alumina / Hydraulic Alumina*

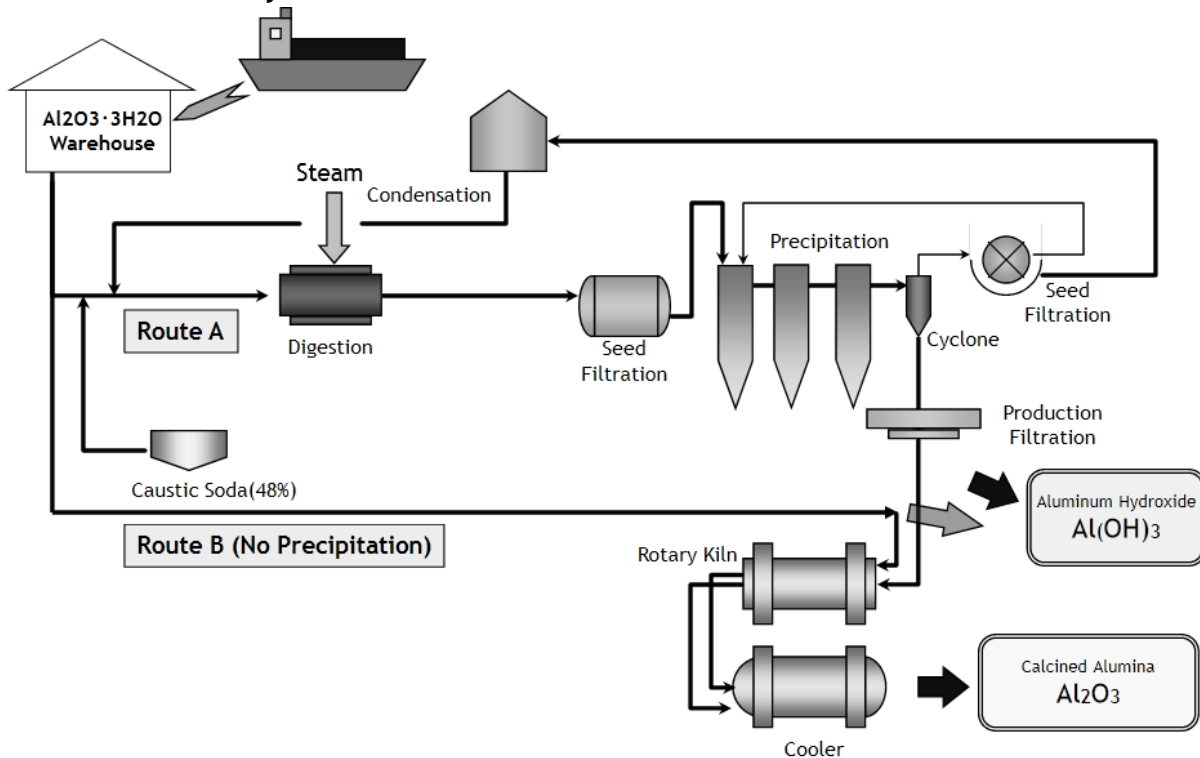


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## 5. Plant & Office Location / Contact

### <Sumitomo Chemical Bayer Process>



### <Important Notice for Users of this Databook>

- (1) All data in this data book is typical and not guaranteed. The typical properties of all the listed products in this data-book are subject to change without prior notice due to continual improvements.
- (2) Applications mentioned in this databook are examples without any guarantee. Fitness for any particular purpose should be verified by customers.
- (3) Please refrain from using products in this databook for medical and food applications.

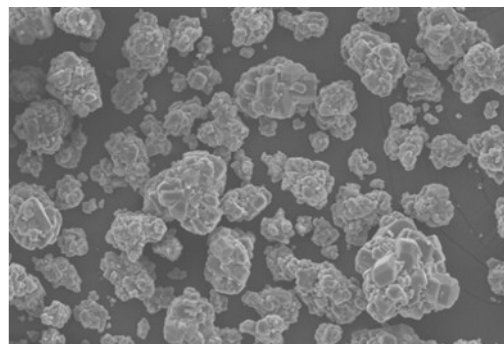
# 1. Aluminum Hydroxide

Sumitomo Aluminum Hydroxides product portfolio is quite wide to serve diverse industries. Our precipitation process in Bayer Process enables us to fine-tune particle sizes and impurity levels to serve various industries.

## Generic Grade / Wet Type

| Typical Properties              |           | Product | C-12          |
|---------------------------------|-----------|---------|---------------|
| Chemical Composition            | H2O       | [%]     | 9             |
|                                 | Al(OH)3*  | [%]     | 99.8          |
|                                 | Fe2O3*    | [%]     | 0.01          |
|                                 | SiO2*     | [%]     | 0.01          |
|                                 | Na2O*     | [%]     | 0.18          |
| Loose Bulk Density              |           | [g/cm3] | 1.1           |
| Packed Bulk Density             |           | [g/cm3] | 1.4           |
| True Specific Gravity           |           |         | 2.42          |
| D50(MT-3300, Laser Diffraction) |           | [μm]    | 50            |
| +75μm                           |           | [%]     | 5             |
| Packing                         | Bulk      |         | Truck, Vessel |
|                                 | Big Bag   |         | 1,000kg       |
|                                 | Paper Bag |         | 25kg          |

C-12 : Extremely low impurity concentration and small particle size. Excellent reactivity.

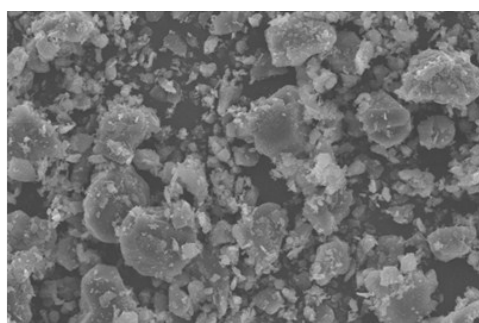


C-12

50μm

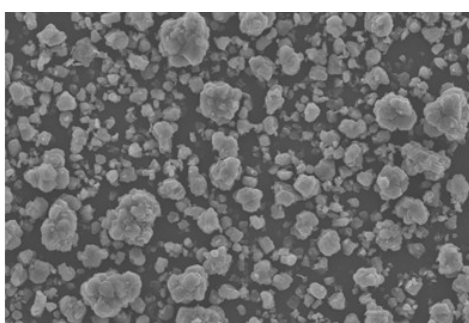
## Fine Grade / Ground, Low-Soda, Very Fine

| Typical Properties              |           | Product   | Ground         |         |       |        | Low Soda |        | Very Fine |        |
|---------------------------------|-----------|-----------|----------------|---------|-------|--------|----------|--------|-----------|--------|
|                                 |           |           | C-3250         | CM-3080 | C-305 | CM-450 | CL-303   | CL-310 | C-302A    | C-301N |
| Chemical Composition            | H2O       | [%]       | 0.2            | 0.4     | 0.07  | 0.3    | 0.07     | 0.04   | 0.12      | 0.2    |
|                                 | Al(OH)3*  | [%]       | 99.7           | 99.7    | 99.8  | 99.7   | 99.9     | 99.9   | 99.7      | 99.8   |
|                                 | Fe2O3*    | [%]       | 0.01           | 0.01    | 0.01  | 0.01   | 0.01     | 0.01   | 0.01      | 0.01   |
|                                 | SiO2*     | [%]       | 0.01           | 0.01    | 0.01  | 0.01   | 0.01     | 0.01   | 0.01      | 0.01   |
|                                 | Na2O*     | [%]       | 0.2            | 0.3     | 0.17  | 0.3    | 0.04     | 0.07   | 0.15      | 0.22   |
| D50(MT-3300, Laser Diffraction) |           | [μm]      | 35             | 11      | 5.5   | 13     | 4        | 12     | 2.4       | 1.5    |
| +75μm                           |           | [%]       | 0.4            | 0.4     | -     | 0.2    | -        | 0.02   | -         | -      |
| +45μm                           |           | [%]       | -              | 2       | <0.1  | 3      | <0.1     | 0.3    | <0.1      | <0.1   |
| Loose Bulk Density              |           | [g/cm3]   | 0.9            | 0.6     | 0.5   | 0.8    | 0.6      | 0.7    | 0.4       | 0.3    |
| Packed Bulk Density             |           | [g/cm3]   | 1.4            | 1.2     | 1.2   | 1.3    | 1.2      | 1.3    | 0.9       | 0.6    |
| DOP Oil Absorption              |           | [ml/100g] | 28             | 33      | 32    | 32     | 37       | 33     | 44        | 56     |
| Whiteness                       |           | [%]       | 97             | 98      | 95    | 97     | -        | 92     | 96        | 96     |
| Specific Surface Area           |           | [m2/g]    | <1             | 6       | -     | 4      | 2        | 1.1    | 3         | 5      |
| Electric Conductivity***        |           | [μS/cm]   | -              | -       | -     | -      | 20       | 18     | 100       | -      |
| True Specific Gravity           |           |           | 2.42           |         |       |        |          |        |           |        |
| Refractive Index                |           |           | 1.57           |         |       |        |          |        |           |        |
| Hardness                        |           | [Mohs]    | 3              |         |       |        |          |        |           |        |
| Packing                         | Big Bag   |           | 500kg, 1,000kg |         |       |        |          |        |           |        |
|                                 | Paper Bag |           | 25kg           |         |       |        |          |        |           |        |



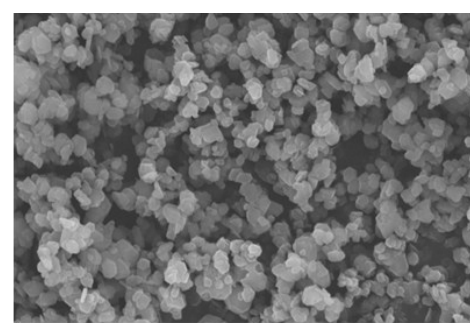
CM-3080

40μm



C-305

200μm



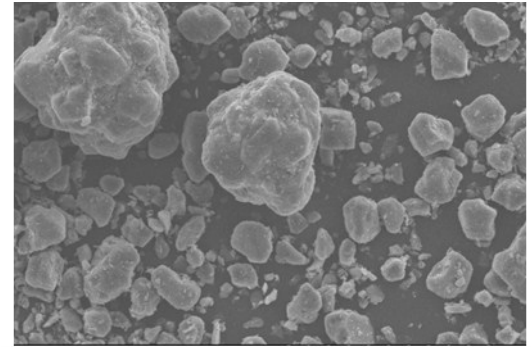
C-301N

4μm

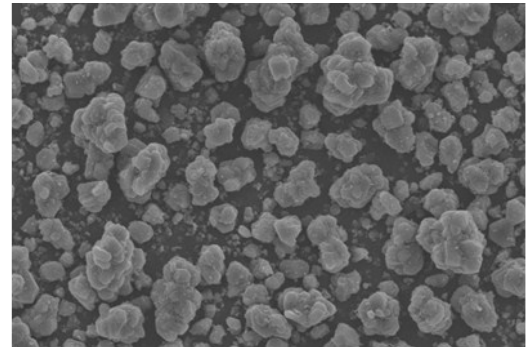
## Fine Grade / High Whiteness

| Typical Properties              |           | Product   | CW-350         | CW-325LV | CW-308 |
|---------------------------------|-----------|-----------|----------------|----------|--------|
| Chemical Composition            | H2O       | [%]       | 0.03           | 0.04     | 0.06   |
|                                 | Al(OH)3*  | [%]       | 99.9           | 99.9     | 99.8   |
|                                 | Fe2O3*    | [%]       | 0.01           | 0.01     | 0.01   |
|                                 | SiO2*     | [%]       | 0.01           | 0.01     | 0.01   |
|                                 | Na2O*     | [%]       | 0.06           | 0.07     | 0.17   |
| D50(MT-3300, Laser Diffraction) |           | [µm]      | 43             | 20       | 10     |
| +45µm                           |           | [%]       | -              | -        | <0.1   |
| Loose Bulk Density              |           | [g/cm3]   | 1.0            | 1.0      | 0.6    |
| Packed Bulk Density             |           | [g/cm3]   | 1.4            | 1.4      | 1.3    |
| DOP Oil Absorption              |           | [ml/100g] | 30             | 26       | 32     |
| True Specific Gravity           |           |           | 2.42           |          |        |
| Refractive Index                |           |           | 1.57           |          |        |
| Hardness                        |           | [Mohs]    | 3              |          |        |
| Packing                         | Big Bag   |           | 500kg, 1,000kg |          |        |
|                                 | Paper Bag |           | 25kg           |          |        |

Impart tone and transparency to artificial marbles / plastics when added as a filler.



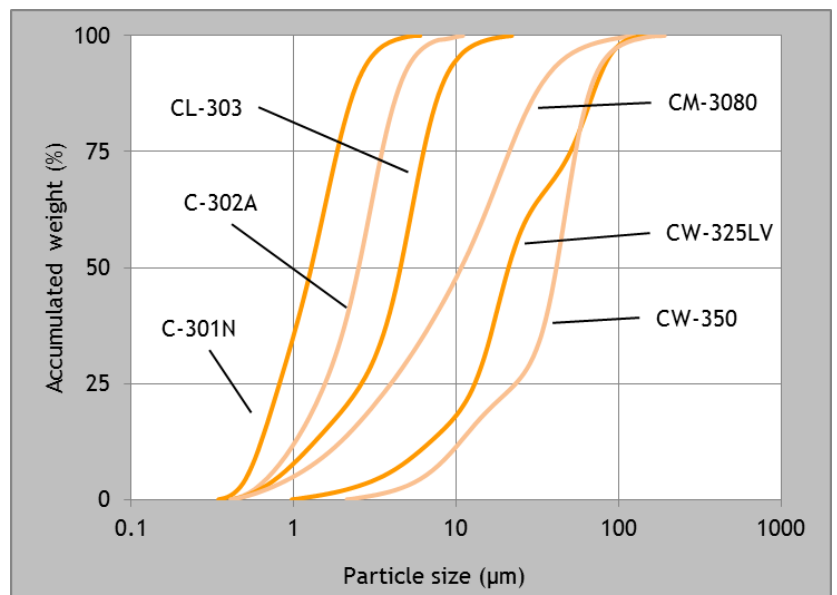
CW-325LV



CW-308

## Fine Grade / High Whiteness (Surface Treated)

| Typical Properties              |           | Product   | CW-350B        | CWL-325J | CW-308B |
|---------------------------------|-----------|-----------|----------------|----------|---------|
| Chemical Composition            | H2O       | [%]       | 0.03           | 0.05     | 0.05    |
|                                 | Al(OH)3*  | [%]       | 99.9           | 99.7     | 99.7    |
|                                 | Fe2O3*    | [%]       | 0.01           | 0.01     | 0.01    |
|                                 | SiO2*     | [%]       | 0.04           | 0.15     | 0.12    |
|                                 | Na2O*     | [%]       | 0.05           | 0.07     | 0.15    |
| D50(MT-3300, Laser Diffraction) |           | [µm]      | 51             | 20       | 10      |
| DOP Oil Absorption              |           | [ml/100g] | 36             | 23       | 26      |
| True Specific Gravity           |           |           | 2.42           |          |         |
| Refractive Index                |           |           | 1.57           |          |         |
| Hardness                        |           | [Mohs]    | 3              |          |         |
| Packing                         | Big Bag   |           | 500kg, 1,000kg |          |         |
|                                 | Paper Bag |           | 25kg           |          |         |





## 2. Aluminium Oxide (Alumina)

Sumitomo Calcined Aluminas are produced in various levels of calcination/soda content and supplied in both unground and ground shapes to satisfy diverse customer requirements.

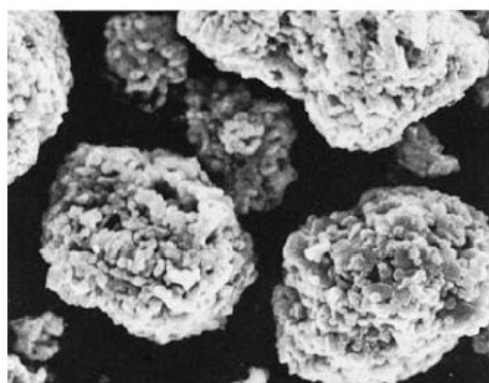
### Normal Soda / Unground

| Typical Properties               |                                | Product              | A-21    | A-26 | A-210 | A-260N | A-260L |
|----------------------------------|--------------------------------|----------------------|---------|------|-------|--------|--------|
| Chemical Composition             | H <sub>2</sub> O               | [%]                  | 0.04    | 0.1  | 0.04  | 0.1    | 0.2    |
|                                  | L.O.I                          | [%]                  | 0.05    | 0.1  | 0.05  | 0.1    | 0.1    |
|                                  | Fe <sub>2</sub> O <sub>3</sub> | [%]                  | 0.01    | 0.01 | 0.01  | 0.01   | 0.01   |
|                                  | SiO <sub>2</sub>               | [%]                  | 0.01    | 0.01 | 0.02  | 0.02   | 0.02   |
|                                  | Na <sub>2</sub> O              | [%]                  | 0.26    | 0.26 | 0.30  | 0.30   | 0.30   |
|                                  | Al <sub>2</sub> O <sub>3</sub> | [%]                  | 99.7    | 99.7 | 99.6  | 99.6   | 99.6   |
| Specific Gravity                 |                                | [g/cm <sup>3</sup> ] | 3.95    | 3.90 | 3.95  | 3.90   | 3.90   |
| D50 (MT-3300, Laser Diffraction) |                                | [μm]                 | 50      | 50   | 90    | 100    | 90     |
| α Crystal Size                   |                                | [μm]                 | 2~4     | <1   | 2~4   | <1     | <1     |
| Bulk Density                     | Green                          | [g/cm <sup>3</sup> ] | 0.7     | 0.9  | 1.0   | 1.0    | 1.0    |
|                                  | Packed                         | [g/cm <sup>3</sup> ] | 1.2     | 1.2  | 1.2   | 1.2    | 1.2    |
| Packing                          | Big Bag                        |                      | 1,000kg |      |       |        |        |
|                                  | Paper Bag                      |                      | 25kg    |      |       |        |        |

A-210 : Generic grade, could be used for various applications. Low dust and good flowability.

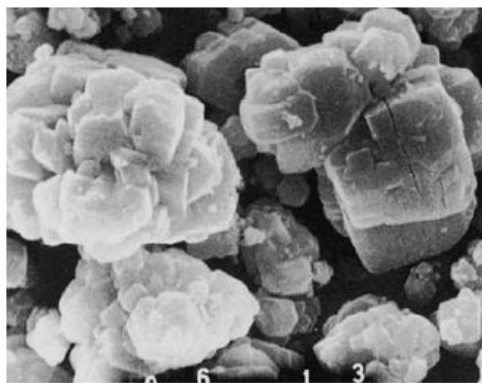
A-260N : Generic grade of smaller α crystal size. Could be used as an easy-sintering alumina when ground.

A-260L : A variation of A-260N with wider surface area and higher reactivity.



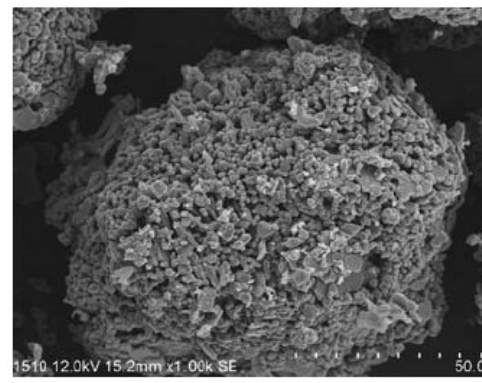
A-21

20μm



A-26

20μm



A-210

20μm

### Intermediate Soda / Unground

| Typical Properties               |                                | Product | AN-210  |
|----------------------------------|--------------------------------|---------|---------|
| Chemical Composition             | H <sub>2</sub> O               | [%]     | 0.04    |
|                                  | L.O.I                          | [%]     | 0.03    |
|                                  | Fe <sub>2</sub> O <sub>3</sub> | [%]     | 0.01    |
|                                  | SiO <sub>2</sub>               | [%]     | 0.05    |
|                                  | Na <sub>2</sub> O              | [%]     | 0.09    |
|                                  | Al <sub>2</sub> O <sub>3</sub> | [%]     | 99.8    |
| D50 [MT-3300, Laser Diffraction] |                                | [μm]    | 90      |
| α Crystal Size                   |                                | [μm]    | 2~4     |
| Packing                          | Big Bag                        |         | 1,000kg |

AN-210 : Easier milling than normal soda products thanks for lower soda content. In addition, sinterability is stable

## Normal Soda / Ground

| Typical Properties               |           | Product                      | AM-21 | AM-210 | AM-210-02 | AM-27 | AM-28B  |  |
|----------------------------------|-----------|------------------------------|-------|--------|-----------|-------|---------|--|
| Chemical Composition             | H2O       | [%]                          | 0.06  | 0.06   | 0.05      | 0.1   | 0.05    |  |
|                                  | L.O.I     | [%]                          | 0.05  | 0.05   | 0.05      | 0.1   | 0.05    |  |
|                                  | Fe2O3     | [%]                          | 0.01  | 0.01   | 0.01      | 0.01  | 0.01    |  |
|                                  | SiO2      | [%]                          | 0.02  | 0.02   | 0.02      | 0.01  | 0.02    |  |
|                                  | Na2O      | [%]                          | 0.26  | 0.30   | 0.30      | 0.26  | 0.25    |  |
|                                  | Al2O3     | [%]                          | 99.7  | 99.6   | 99.6      | 99.7  | 99.7    |  |
| Specific Gravity                 |           | [g/cm3]                      | 3.95  | 3.95   | 3.95      | 3.90  | 3.95    |  |
| D50 (MT-3300, Laser Diffraction) |           | [ $\mu$ m]                   | 4.8   | 4.8    | 7.9       | 2.8   | 19      |  |
| $\alpha$ Crystal Size            |           | [ $\mu$ m]                   | 2~4   | 2~4    | 2~4       | 0.3   | 3~5     |  |
| Bulk Density                     | Green     | [g/cm3]                      | 0.7   | 0.7    | -         | 0.6   | 0.6     |  |
|                                  | Packed    | [g/cm3]                      | 1.3   | 1.3    | -         | 1.3   | 1.6     |  |
| Oil Absorption                   |           | Boiled Linseed Oil [ml/100g] | 16    | -      | -         | 27    | 24      |  |
| Green Density*                   |           | [g/cm3]                      | 2.26  | 2.26   | -         | -     | -       |  |
| Fire Density*                    |           | [g/cm3]                      | 3.72  | 3.72   | -         | -     | -       |  |
| Packing                          | Big Bag   |                              |       |        |           |       | 1,000kg |  |
|                                  | Paper Bag |                              |       |        |           |       | 25kg    |  |

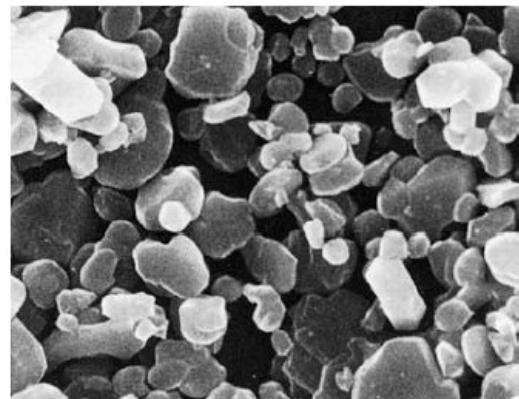
\* Flux 4%, 49MPa(500kg/cm<sup>2</sup>), sample sintered at 1600 degC.

AM-210 / AM-21 : Generic grade, could be used for various applications.

AM-210-02 : A variation of AM-210 with shorter milling time. By-modal particle size distribution.

AM-27 : Finely ground, mainly for buff polish of mirror polishing grade.

AM-28B : Specially developed for buff polish, retaining coarse particles to a certain extent to be crumbled to fine particles.



AM-21

5 $\mu$ m

## Low Soda / Unground

| Typical Properties               |           | Product           | AL-41-01 | AL-43-01 | AL-420A |
|----------------------------------|-----------|-------------------|----------|----------|---------|
| Chemical Composition             | H2O       | [%]               | 0.05     | 0.05     | 0.05    |
|                                  | L.O.I     | [%]               | 0.05     | 0.05     | 0.05    |
|                                  | Fe2O3     | [%]               | 0.01     | 0.01     | 0.01    |
|                                  | SiO2      | [%]               | 0.04     | 0.05     | 0.08    |
|                                  | Na2O      | [%]               | 0.04     | 0.03     | 0.03    |
|                                  | Al2O3     | [%]               | 99.9     | 99.9     | 99.9    |
| D50 (MT-3300, Laser Diffraction) |           | [ $\mu\text{m}$ ] | 50       | 50       | 90      |
| $\alpha$ Crystal Size            |           | [ $\mu\text{m}$ ] | 1~2      | 2~3      | 2~3     |
| Packing                          | Big Bag   |                   | 1,000kg  |          |         |
|                                  | Paper Bag |                   | 25kg     |          |         |

AL-41-01 / AL-43-01 :  $\alpha$  crystal sizes are different, and consequently molding density and firing shrinkage vary. Customers could choose either one of them depending on application requirements.

AL-420A : Originally developed for LCD glass applications. Easy handling due to good flowability.

## Low Soda / Ground

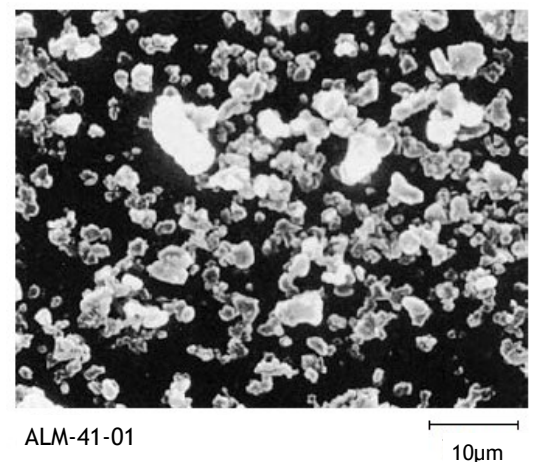
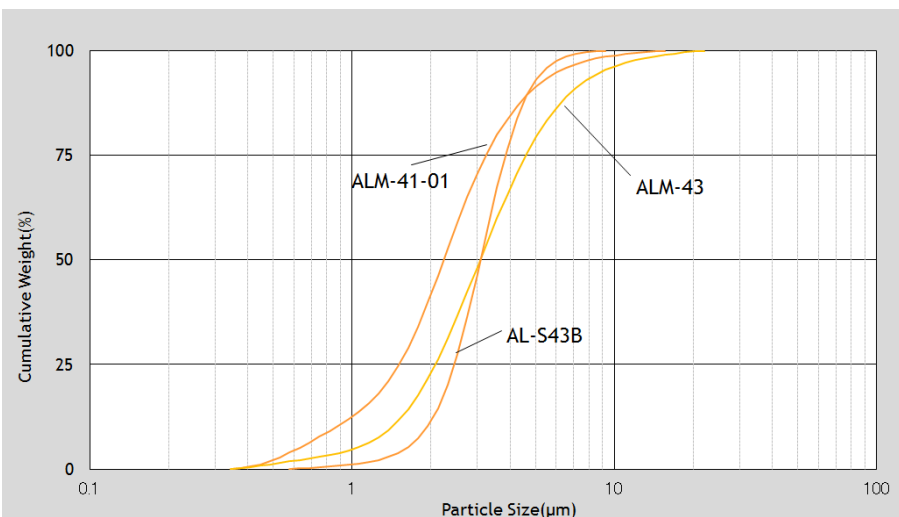
| Typical Properties               |           | Product              | ALM-41-01 | ALM-43 | AL-M73A | AL-S43B | AL-S43A |
|----------------------------------|-----------|----------------------|-----------|--------|---------|---------|---------|
| Chemical Composition             | H2O       | [%]                  | 0.08      | 0.07   | 0.07    | 0.07    | 0.07    |
|                                  | L.O.I     | [%]                  | 0.07      | 0.05   | 0.05    | 0.05    | 0.05    |
|                                  | Fe2O3     | [%]                  | 0.01      | 0.01   | 0.01    | 0.01    | 0.01    |
|                                  | SiO2      | [%]                  | 0.04      | 0.05   | 0.05    | 0.05    | 0.05    |
|                                  | Na2O      | [%]                  | 0.04      | 0.03   | 0.03    | 0.04    | 0.04    |
|                                  | Al2O3     | [%]                  | 99.9      | 99.9   | 99.9    | 99.9    | 99.9    |
| D50 (MT-3300, Laser Diffraction) |           | [ $\mu\text{m}$ ]    | 2.2       | 3.7    | 3.0     | 3.1     | 3.8     |
| $\alpha$ Crystal Size            |           | [ $\mu\text{m}$ ]    | 1~2       | 2~3    | 2~3     | 1.5~2.5 | 1.5~2.5 |
| Green Density*                   |           | [g/cm <sup>3</sup> ] | 2.23      | 2.27   | 2.28    | 2.10    | 2.10    |
| Fire Density*                    |           | [g/cm <sup>3</sup> ] | 3.71      | 3.67   | 3.67    | 3.67    | 3.67    |
| Linear Shrinkage*                |           | [%]                  | 16        | 15     | 15      | 17      | 17      |
| Packing                          | Big Bag   |                      | 1,000kg   |        |         |         |         |
|                                  | Paper Bag |                      | 25kg      |        |         |         |         |

\*Flux 4%, 49MPa (500kg/cm<sup>2</sup>), sample sintered at 1600 deg C.

ALM-41-01 / ALM-43 : Milling unground grades down to  $\alpha$  crystal sizes.

AL-M73A : Narrower particle distribution than ALM-43

AL-S43B : Narrower particle distribution than AL-M73A. Suitable for ceramic package; narrow particle distribution enables debinding without lots of difficulty.



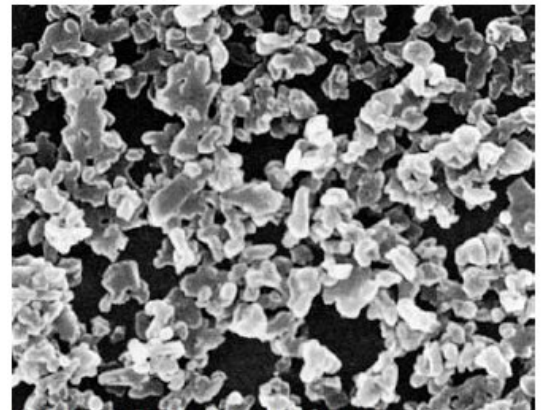
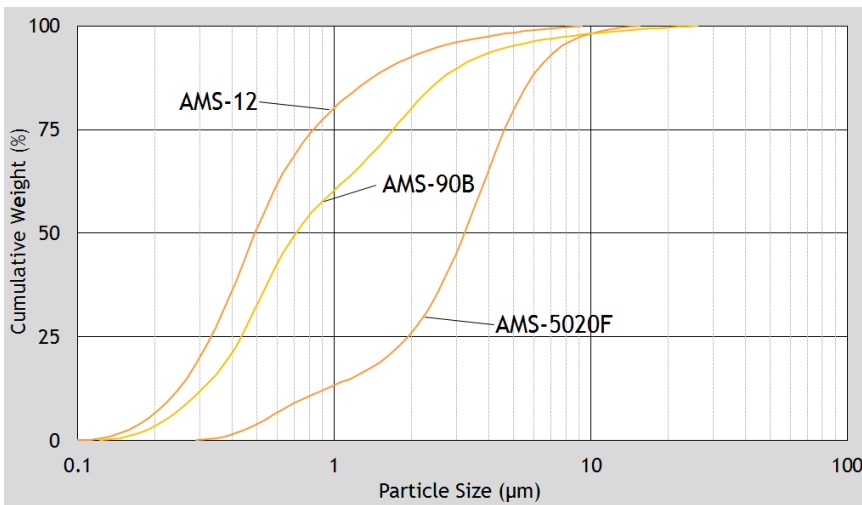
## Normal Soda / Easy Sintering

| Typical Properties               |           | Product           | AMS-5020F | AMS-90B | AMS-12 |
|----------------------------------|-----------|-------------------|-----------|---------|--------|
| Chemical Composition             | H2O       | [%]               | 0.1       | 0.1     | 0.1    |
|                                  | L.O.I     | [%]               | 0.1       | 0.3     | 0.2    |
|                                  | Fe2O3     | [%]               | 0.01      | 0.01    | 0.01   |
|                                  | SiO2      | [%]               | 0.02      | 0.01    | 0.01   |
|                                  | Na2O      | [%]               | 0.30      | 0.30    | 0.26   |
|                                  | Al2O3     | [%]               | 99.6      | 99.6    | 99.7   |
| Specific Gravity                 |           | [g/cm3]           | 3.95      | 3.90    | 3.90   |
| D50 (MT-3300, Laser Diffraction) |           | [ $\mu\text{m}$ ] | 3.2       | 0.7     | 0.49   |
| $\alpha$ Crystal Size            |           | [ $\mu\text{m}$ ] | 0.3~4     | 0.3     | 0.3    |
| Green Density*                   |           | [g/cm3]           | 2.44      | 2.07    | 2.18   |
| Fire Density*                    |           | [g/cm3]           | 3.40      | 3.82    | 3.87   |
| Packing                          | Big Bag   |                   | 1,000kg   |         |        |
|                                  | Paper Bag |                   | 25kg      |         |        |

\*No flux added, 29.4MPa (300kg/cm<sup>2</sup>), sample sintered at 1600 deg C.

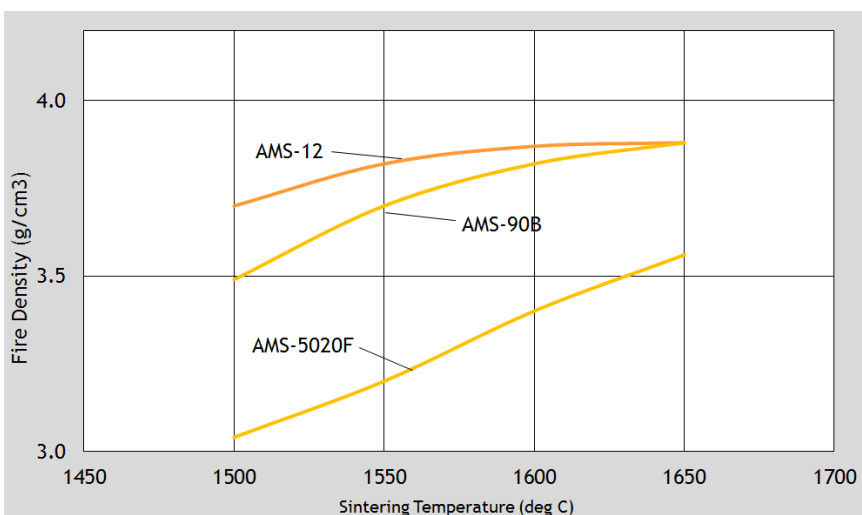
AMS-5020F : Enables high filling ratio thanks for bi-modal and broad particle distribution. Refractory plasticizer and low shrinkage ceramics are typical applications for this product.

AMS-90B : Mono-modal particle distribution. Developed mainly for refractory applications.



AMS-90B

2 $\mu\text{m}$





## Low Soda / Easy Sintering

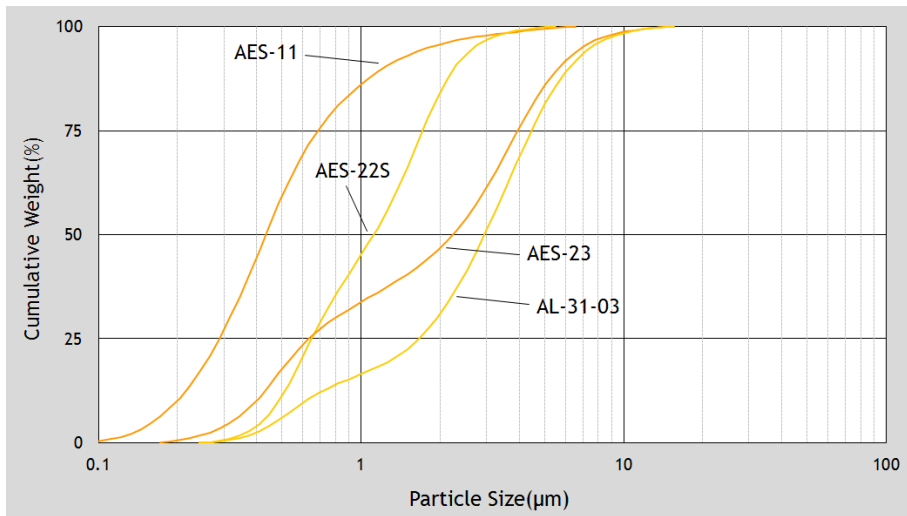
| Typical Properties               |                                | Product | AES-12 | AES-11 | AES-11C | AES-11F | AES-22S | AES-23 | AL-31-03 |
|----------------------------------|--------------------------------|---------|--------|--------|---------|---------|---------|--------|----------|
| Chemical Composition             | H <sub>2</sub> O               | [%]     | 0.1    | 0.1    | 0.1     | 0.1     | 0.1     | 0.1    | 0.1      |
|                                  | L.O.I                          | [%]     | 0.1    | 0.2    | 0.1     | 0.1     | 0.1     | 0.1    | 0.1      |
|                                  | Fe <sub>2</sub> O <sub>3</sub> | [%]     | 0.01   | 0.01   | 0.01    | 0.01    | 0.01    | 0.01   | 0.01     |
|                                  | SiO <sub>2</sub>               | [%]     | 0.03   | 0.03   | 0.03    | 0.03    | 0.02    | 0.04   | 0.04     |
|                                  | Na <sub>2</sub> O              | [%]     | 0.04   | 0.04   | 0.04    | 0.04    | 0.02    | 0.04   | 0.03     |
|                                  | MgO*                           | [%]     | -      | 0.11   | 0.05    | 0.05    | -       | -      | -        |
|                                  | Al <sub>2</sub> O <sub>3</sub> | [%]     | 99.9   | 99.9   | 99.9    | 99.9    | 99.9    | 99.9   | 99.9     |
| D50 (MT-3300, Laser Diffraction) | [μm]                           | 0.44    | 0.43   | 0.39   | 0.47    | 1.1     | 2.2     | 3.0    |          |
| α Crystal Size                   | [μm]                           | 0.3     | 0.3    | 0.3    | 0.3     | 0.3~1.0 | 0.3~4   | 0.3~4  |          |
| Green Density**                  | [g/cm <sup>3</sup> ]           | 2.22    | 2.22   | 2.20   | 2.17    | 2.35    | 2.57    | 2.56   |          |
| Fire Density**                   | [g/cm <sup>3</sup> ]           | 3.88    | 3.93   | 3.94   | 3.93    | 3.88    | 3.77    | 3.22   |          |
| Linear Shrinkage**               | [%]                            | 17      | 17     | 18     | 18      | 15      | 12      | 7      |          |
| Packing                          | Paper Bag                      | 25kg    |        |        |         |         |         |        |          |

\*MgO is an additive and not considered as an impurity in Al<sub>2</sub>O<sub>3</sub>.

\*\*No flux added, 29.4MPa (300kg/cm<sup>2</sup>), sample sintered at 1600 deg C.

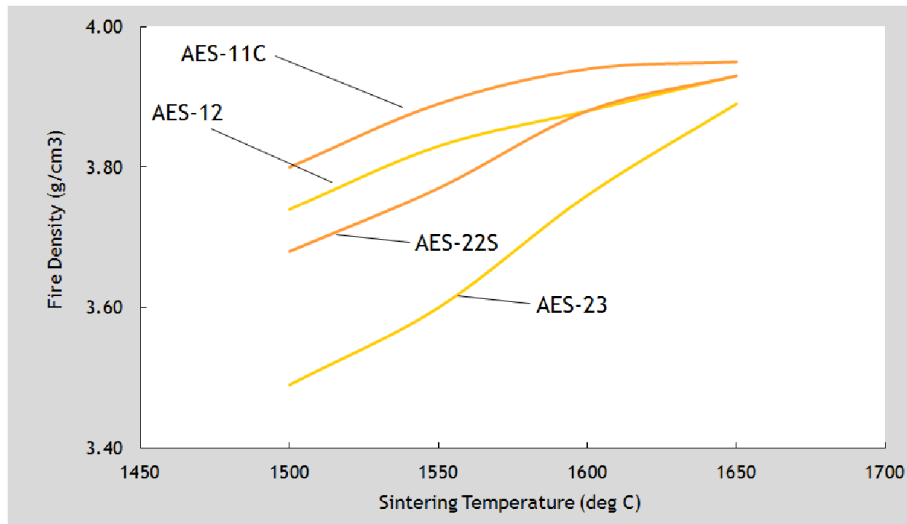
AES Series : Sub-micron size particles, used for fine ceramic applications requiring 99% purity or more.

AL-31-03 : Bi-modal particle distribution, which enables high filling ratio. Refractory plasticizer is one of typical applications for this product.



AES-12

2μm



### 3. High Purity Alumina (HPA)

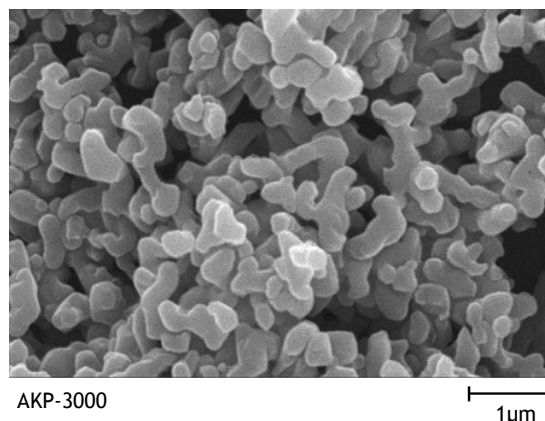
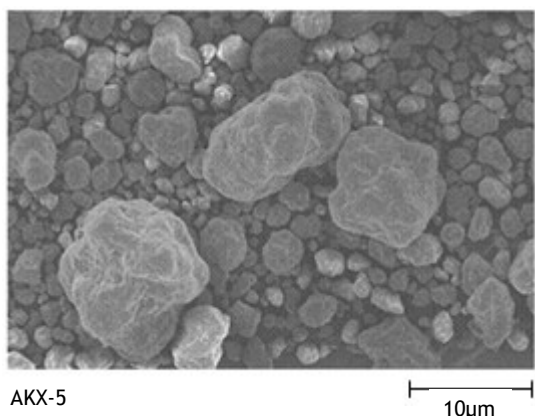
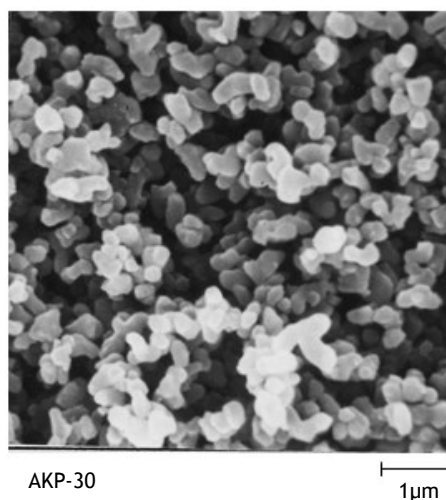
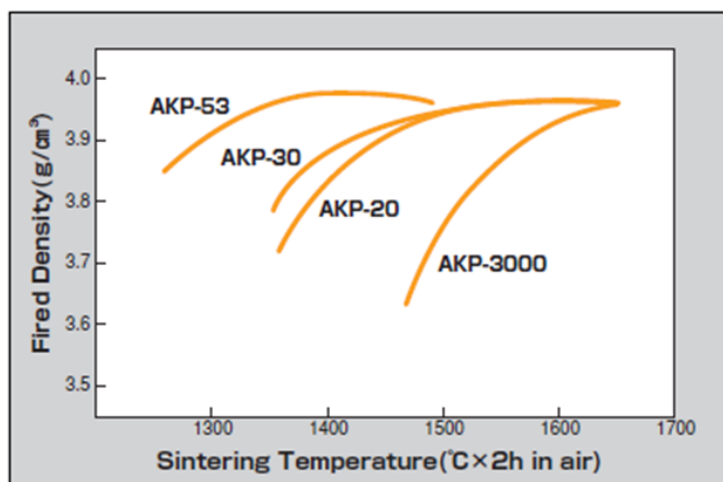
Sumitomo High Purity Aluminas(HPA) are uniform fine powder characterized by fine powder form of highly pure and homogeneous crystal structure. They're manufactured by aluminium alkoxide hydrolysis process.

#### High Purity Alumina (HPA)

| Typical Properties                      |                      | Product        | AKX-5   | AKP-20  | AKP-30  | AKP-50  | AKP-53  | AKP-3000                                     |
|---|----------------------|----------------|---|---------|---------|---------|---------|--|
| Crystal Structure                       |                      |                | α   | α       | α       | α       | α       | α  |
| Purity(Al <sub>2</sub> O <sub>3</sub> ) | [%]                  |                | ≥ 99.99   | ≥ 99.99 | ≥ 99.99 | ≥ 99.99 | ≥ 99.99 | ≥ 99.99                                      |
| Mean Particle Size (MT3300)             | [μm]                 |                | -   | 0.46    | 0.27    | 0.20    | 0.18    | 0.70   |
| Loose Bulk Density                      | [g/cm <sup>3</sup> ] |                | 2.2   | 0.9     | 0.9     | 0.9     | 1       | 0.41   |
| Tapped Bulk Density                     | [g/cm <sup>3</sup> ] |                | -   | 1.4     | 1.3     | 1.3     | 1.4     | 0.80   |
| BET Surface Area                        | [m <sup>2</sup> /g]  |                | 0.3   | 4.3     | 6.7     | 10.3    | 11.7    | 4.5  |
| Impurity                                | Si                   | [ppm]          | 6   | 16      | 14      | 11      | 33      | 4  |
|   | Fe                   | [ppm]          | 3   | 3       | 3       | 4       | 4       | 3  |
|   | Na                   | [ppm]          | 2   | 4       | 2       | 2       | 2       | 2  |
|   | Mg                   | [ppm]          | 1   | 3       | 3       | 2       | 5       | 1  |
|   | Cu                   | [ppm]          | 1   | 1       | 1       | 1       | 1       | 1  |
| Packing                                 | PE Bag               |                |   | 20kg    | 20kg    | 20kg    | 20kg    | 10kg   |
|   | Paper Drum           |                | 100kg   |         |         |         |         |  |
| Application                             |                      | Single Crystal | High-strength and high-density Ceramics, Composite Materials, Additives for non-Oxide Ceramics, Abrasives, Plasma Spray, Ceramic Filter, etc. |         |         |         |         | Insulation layer of Li-ion Secondary Battery |

AKX-5 : Various particle sizes of AKX-5 make the bulk density high, so it is suitable for growing single crystal.

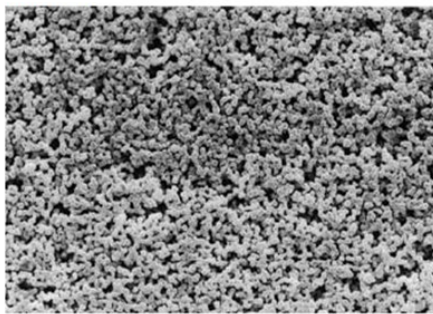
AKP Series : High purity powder composed of homogeneous α-alumina crystal particles.



Sumitomo Chemical Advanced Aluminas are  $\alpha$ -alumina single crystals with precisely controlled particle size distribution and almost-spherical polyhedral shape.

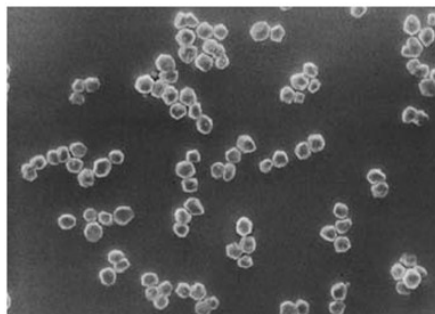
### Advanced Alumina (AA)

| Product                                 |   | AA-03    | AA-04    | AA-05    | AA-07    | AA-1.5   | AA-3     | AA-18    |
|---|---|----------|----------|----------|----------|----------|----------|----------|
| Typical Properties                      |   |          |          |          |          |          |          |          |
| Crystal Structure                       |   | $\alpha$ | $\alpha$ | $\alpha$ | $\alpha$ | $\alpha$ | $\alpha$ | $\alpha$ |
| Purity(Al <sub>2</sub> O <sub>3</sub> ) | [%]   | ≧ 99.99  | ≧ 99.99  | ≧ 99.99  | ≧ 99.99  | ≧ 99.99  | ≧ 99.99  | ≧ 99.99  |
| Mean Particle Size(MT3300)              | [ $\mu$ m]  | 0.44     | 0.50     | 0.53     | 0.83     | 1.6      | 3.4      | 20.3     |
| Loose Bulk Density                      | [g/cm <sup>3</sup> ]  | 0.5      | 0.5      | 0.6      | 0.6      | 0.6      | 0.7      | 2.0      |
| Tapped Bulk Density                     | [g/cm <sup>3</sup> ]  | 0.9      | 1.0      | 1.1      | 1.2      | 1.3      | 1.5      | 2.4      |
| BET Surface Area                        | [m <sup>2</sup> /g]   | 5.2      | 4.1      | 3.2      | 2.2      | 1.1      | 0.5      | 0.1      |
| Impurity                                | Si [ppm]  | 5        | 4        | 3        | 3        | 4        | 18       | 15       |
|   | Fe [ppm]  | 4        | 4        | 4        | 4        | 3        | 3        | 5        |
|   | Na [ppm]  | 5        | 5        | 5        | 5        | 5        | 5        | 2        |
|   | Mg [ppm]  | 1        | 1        | 1        | 1        | 1        | 1        | 1        |
|   | Cu [ppm]  | 1        | 1        | 1        | 1        | 1        | 1        | 1        |
| Packing                                 | PE Bag  | 20kg     | 20kg     | 20kg     | 20kg     | 20kg     | 20kg     |          |
|   | Pail Can  |          |          |          |          |          |          | 20kg     |
| Application                             | High-strength and high-density Ceramics, Resin filler(thermal conductive materials), Plasma Spray, Catalyst, Ceramic Filter, etc. |          |          |          |          |          |          |          |



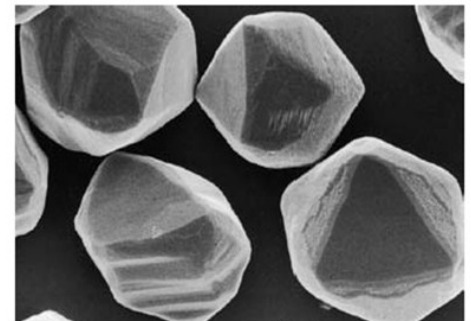
AA-04

5 $\mu$ m



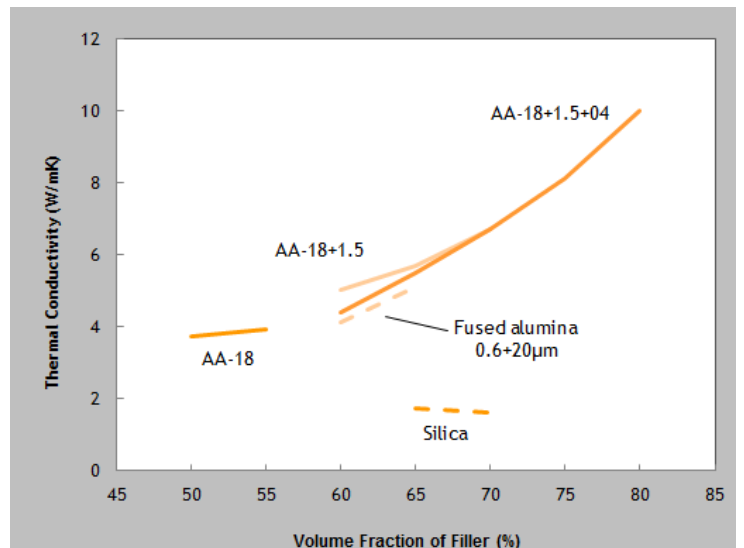
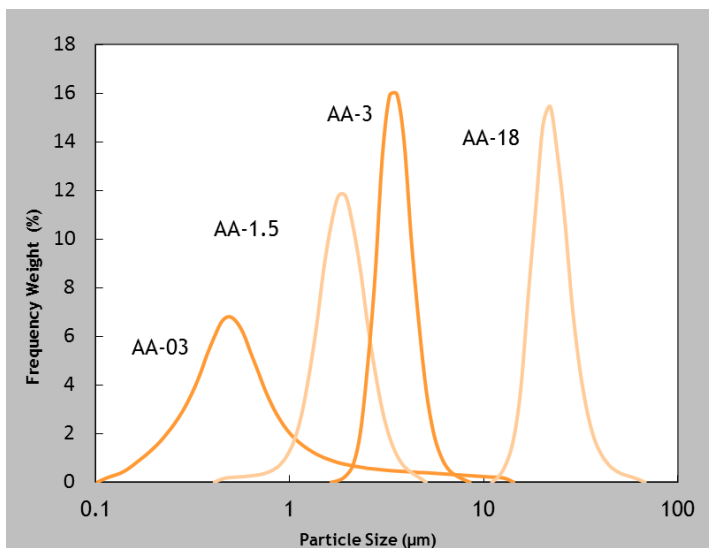
AA-1.5

10 $\mu$ m



AA-18

20 $\mu$ m



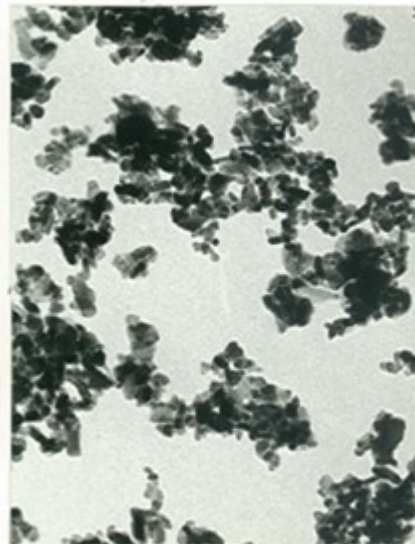
## Gamma HPA

| Typical Properties                      |                      | Product | AKP-G15      | AKP-G07      |
|---|----------------------|---------|--------------|--------------|
| Crystal Structure                       |                      |         | $\gamma$     | $\theta$     |
| Purity(Al <sub>2</sub> O <sub>3</sub> ) | [%]                  |         | $\geq 99.99$ | $\geq 99.99$ |
| Loose Bulk Density                      | [g/cm <sup>3</sup> ] |         | 0.14         | -            |
| Tapped Bulk Density                     | [g/cm <sup>3</sup> ] |         | 0.19         | 0.3          |
| BET Surface Area                        | [m <sup>2</sup> /g]  |         | 164          | 72.9         |
| Impurity                                | Si                   | [ppm]   | 2            |              |
|   | Fe                   | [ppm]   | 3            |              |
|   | Na                   | [ppm]   | 2            |              |
|   | Mg                   | [ppm]   | 1            |              |
|   | Cu                   | [ppm]   | $\leq 1$     |              |
| Humidity                                | [%]                  |         |              | 0            |
| Packing                                 | Corrugated Paper Box |         | 10Kg         | 20Kg         |



AKP-G15

0.1  $\mu$ m



AKP-G07

0.1  $\mu$ m

# 4. Activated Alumina / Hydraulic Alumina

## Activated Alumina : Powder Shape

| Typical Properties   |   | Product | Powders |       |        |         | Chromatography Grade |           |
|----------------------|---|---------|---------|-------|--------|---------|----------------------|-----------|
|                      |   |         | KC-501  | A-11  | AC-11  | AC-12R  | KCG-30               | KCG-1525W |
| Chemical Composition | L.O.I   | [%]     | 4.5     | 4.0   | 4.5    | 4.5     | 3.5                  | 3.5       |
|                      | Fe2O3   | [%]     | 0.01    | 0.02  | 0.02   | 0.02    | 0.02                 | 0.02      |
|                      | SiO2  | [%]     | 0.02    | 0.02  | 0.02   | 0.02    | 0.02                 | 0.02      |
|                      | Na2O  | [%]     | 0.45    | 0.26  | 0.26   | 0.26    | 0.26                 | 0.26      |
|                      | Al2O3   | [%]     | 99.5    | 99.7  | 99.7   | 99.7    | 99.7                 | 99.7      |
| Physical Properties  | True specific gravity                           |         | -       | 3.1   | 3.1    | 3.1     | 3.1                  | 3.1       |
|                      | Apparent specific gravity (Packed bulk density) | [g/cm3] | 0.3     | 1.1   | 1.1    | 1.1     | 1.1                  | 1.1       |
|                      | Mean particle size                              | [µm]    | 1.5     | 40-50 | 80-100 | 100-200 | 40-50                | 80-100    |
|                      | Specific surface area                           | [m2/g]  | 200     | 150   | 140    | 130     | 150                  | 140       |
|                      | Pore volume                                     | [mL/g]  | -       | 0.30  | 0.30   | 0.30    | 0.30                 | 0.30      |
| Packing              | Paper Bag / PE Bag                              |         | -       | 25kg  | 25kg   | -       | -                    | -         |
|                      | Pail Can  |         | 5kg     | -     | -      | 15kg    | 15kg                 | 15kg      |
|                      | Drum  |         | 50kg    | -     | -      | 180kg   | -                    | -         |

|                            |                         |                   |        |
|----------------------------|-------------------------|-------------------|--------|
| Easy to be adsorped ↑      | organic acid            | $PO_4^{-3}$       | $F^-$  |
|                            | water                   |                   |        |
|                            | alcohol                 | $F^-$             |        |
|                            | amine                   |                   |        |
|                            | mercaptan               | $[Fe(CN)_6]^{-4}$ |        |
|                            | aldehyde                |                   | $Cl^-$ |
|                            | ketone                  | $SO_4^{-2}$       |        |
|                            | ester                   |                   |        |
|                            | ether                   | $[Fe(CN)_6]^{-3}$ |        |
|                            | aromatic hydrocarbon    | $Cr_2O_7^{-2}$    | $Br^-$ |
| Difficult to be adsorped ↓ | sulfide                 | $Cl^-$            |        |
|                            | organic halogen         |                   |        |
|                            | unsaturated hydrocarbon | $MnO_4^-$         |        |
|                            | saturated hydrocarbon   | $ClO_4^-$         | $I^-$  |

Activated Alumina can be used as an adsorption refining agent, especially to refine non-polar solvents.

In general, the more polarity and heavier molecular weight, the better adsorption effect would be obtained.

Adsorption order example as follows.  
 $-SO_3H > -COOH > -OH, -NH_2, -SH > -CHO$   
 $> -CO > -COOR > -S-, -O- > -X$   
 $> \text{Unsaturated hydrocarbons}$   
 $> \text{Saturated hydrocarbons}$

Adsorption performance can be measured in terms adsorption rate and transmitting rate of the picric acid by sending a benzene solution of picric acid through a column filled with activated alumina.



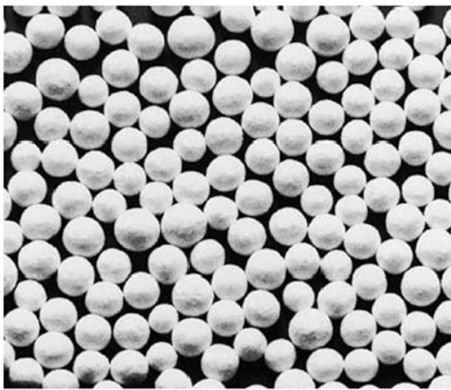
## Activated Alumina : Spherical (KH)

| Typical Properties   |                       | Product   | KHS       |       | KHA  |       | KHO  |      |       | KHD  |  |
|----------------------|-----------------------|-----------|-----------|-------|------|-------|------|------|-------|------|--|
|                      |                       |           | -46       | -46   | -24  | -46   | -24  | -12  | -46   | -24  |  |
| Appearance           | Form                  |           | Spherical |       |      |       |      |      |       |      |  |
|                      | Color                 |           | White     |       |      |       |      |      |       |      |  |
|                      | Particle Size         | [mm]      | 4-6       | 4-6   | 2-4  | 4-6   | 2-4  | 1-2  | 4-6   | 2-4  |  |
| Chemical Composition | L.O.I                 | [%]       | 3.5       | 1.9   |      | 1.5   |      | 2.4  | 5.4   |      |  |
|                      | Fe2O3                 | [%]       | 0.02      | 0.02  |      | 0.02  |      |      | 0.02  |      |  |
|                      | SiO2                  | [%]       | 0.02      | 0.02  |      | 0.02  |      |      | 0.02  |      |  |
|                      | Na2O                  | [%]       | 0.04      | 0.26  |      | 0.26  |      |      | 0.26  |      |  |
|                      | Al2O3                 | [%]       | 99.9      | 99.7  |      | 99.7  |      |      | 99.7  |      |  |
| Physical Properties  | Bulk density          | [kg/L]    | 0.60      | 0.73  | 0.74 | 0.80  | 0.83 | 0.85 | 0.82  | 0.86 |  |
|                      | Pore volume           | [mL/g]    | 0.64      | 0.51  |      | 0.43  |      |      | 0.38  |      |  |
|                      | Specific surface area | [m2/g]    | 155       | 150   |      | 140   |      | 190  | 270   |      |  |
| Mechanical strength  | Attrition loss        | [%]       | 0.3       | 0.4   |      | 0.4   |      | 0.2  | 0.2   |      |  |
|                      | Crushing strength     | [daN]     | 17        | 26    | 13   | 33    | 18   | 5    | 30    | 16   |  |
| H2O Adsorption       | Effluent gas moisture | [gH2O/m3] |           |       |      |       |      |      | 0.003 |      |  |
|                      | Adsorption Capacity   | 10% RH    | [%]       |       |      |       |      |      | 5.3   | 5.5  |  |
|                      |                       | 50% RH    | [%]       |       |      |       |      |      | 13.6  | 14.8 |  |
|                      |                       | 90% RH    | [%]       |       |      |       |      |      | 34    | 34.1 |  |
| Packing              | Drum                  |           | 120kg     | 130kg |      | 150kg |      |      | 160kg |      |  |
|                      | Square Can            |           | 10kg      | 10kg  |      | 15kg  |      | -    | 15kg  |      |  |
|                      | Paper bag             |           | -         | -     |      | -     |      | 20kg | -     |      |  |

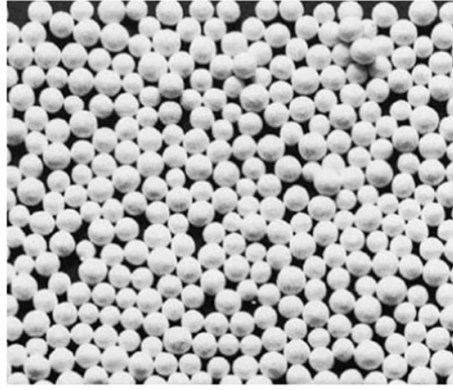
## Activated Alumina : Spherical (NK)

| Typical Properties   |                       | Product   | NKHD      |       |       |       | NKHO  | HD    | FD    |
|----------------------|-----------------------|-----------|-----------|-------|-------|-------|-------|-------|-------|
|                      |                       |           | -46       | -24   | -46HD | -24HD | -24   | -13   | -24   |
| Appearance           | Form                  |           | Spherical |       |       |       |       |       |       |
|                      | Color                 |           | White     |       |       |       |       |       |       |
|                      | Particle Size         | [mm]      | 4-6       | 2-4   | 4-6   | 2-4   | 2-4   | 1-2   | 2-4   |
| Chemical Composition | L.O.I                 | [%]       | 6.4       |       | 5.9   |       | 1.8   | 6.1   | 6.3   |
|                      | Fe2O3                 | [%]       | 0.02      |       |       |       |       |       |       |
|                      | SiO2                  | [%]       | 0.02      |       |       |       |       |       |       |
|                      | Na2O                  | [%]       | 0.26      |       |       |       |       |       |       |
|                      | Al2O3                 | [%]       | 99.7      |       |       |       |       |       |       |
| Physical Properties  | Bulk density          | [kg/L]    | 0.60      | 0.64  | 0.74  | 0.77  | 0.61  | 0.80  | 0.68  |
|                      | Pore volume           | [mL/g]    | 0.60      |       | 0.45  |       | 0.62  | 0.45  | 0.55  |
|                      | Specific surface area | [m2/g]    | 300       |       | 290   |       | 170   | 290   | 280   |
| Mechanical strength  | Attrition loss        | [%]       | 0.3       |       | 0.3   |       | 0.2   | 0.4   | 0.2   |
|                      | Crushing strength     | [daN]     | 10        | 5     | 30    | 16    | 5     | 5     | 7     |
| H2O Adsorption       | Effluent gas moisture | [gH2O/m3] | 0.003     |       | 0.003 |       |       |       | 0.003 |
|                      | Adsorption Capacity   | 10% RH    | [%]       | 5.7   | 5.7   | 5.8   | 6.1   |       | 5.8   |
|                      |                       | 50% RH    | [%]       | 15.5  | 16.0  | 15.7  | 16.7  |       | 16.0  |
|                      |                       | 90% RH    | [%]       | 37.8  | 39.3  | 37.0  | 38.2  |       | 37.0  |
| Packing              | Drum                  |           | 120kg     | 150kg |       | 120kg | 150kg | 120kg |       |
|                      | Square Can            |           | 10kg      | 15kg  |       | 10kg  | -     | 10kg  |       |

NK contains more macropores than KH and has larger pore volume and the weight is lighter.



KHD-46(Actual)



KHD-24(Actual)

## Hydraulic Alumina

| Typical Properties   |   | Product              | BK-112 |
|----------------------|---|----------------------|--------|
| Chemical Composition | L.O.I   | [%]                  | 6.6    |
|                      | Fe <sub>2</sub> O <sub>3</sub>                  | [%]                  | 0.05   |
|                      | SiO <sub>2</sub>                                | [%]                  | 0.01   |
|                      | Na <sub>2</sub> O                               | [%]                  | 0.25   |
|                      | Al <sub>2</sub> O <sub>3</sub>                  | [%]                  | 99.7   |
| Physical Properties  | True specific gravity                           |                      | 3.0    |
|                      | Apparent specific gravity (Packed bulk density) | [g/cm <sup>3</sup> ] | 1.0    |
|                      | Mean particle size                              | [μm]                 | 16     |
| Packing              |   | Drum                 | 120kg  |
|                      |   | Pail Can             | 10kg   |

An alumina powder with a large surface area and some crystal water.

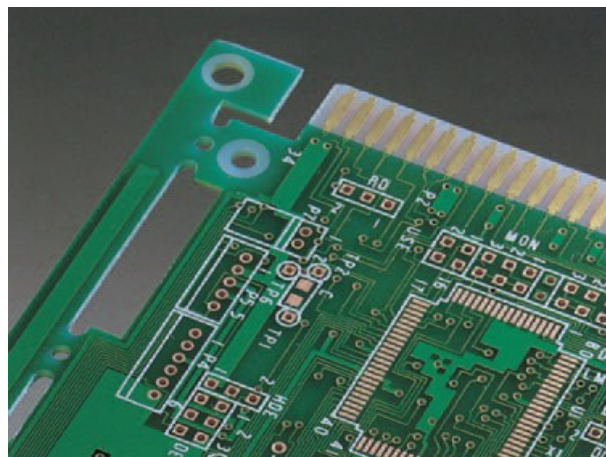
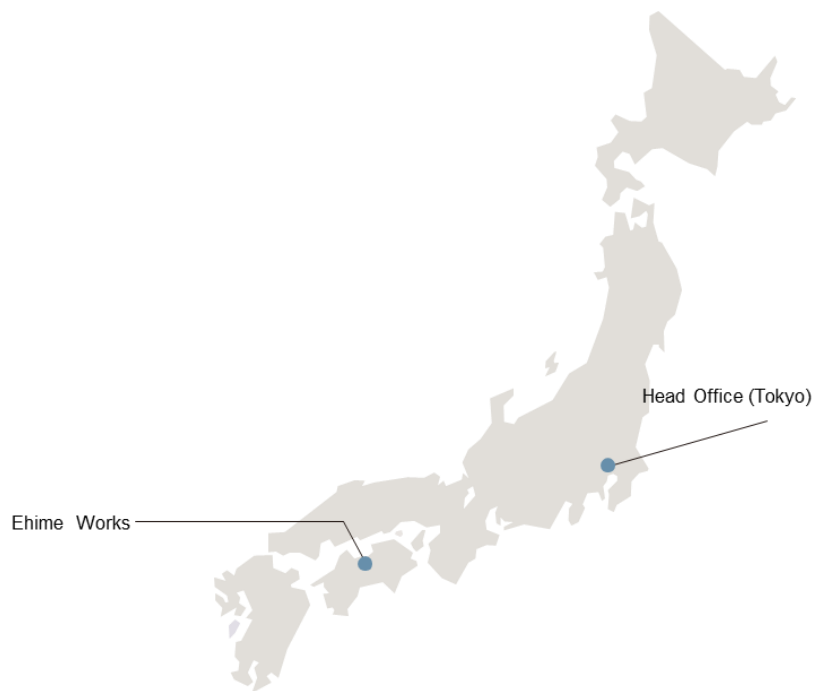
Used as a binder for refractories instead of alumina cement due to large caking capacity and plasticity.

Condition/setting time of the hydraulic alumina and water mixture

| Water Volume (g/100g-Al <sub>2</sub> O <sub>3</sub> ) | Kneaded material condition | Setting Time* (min.) |
|---|----------------------------|----------------------|
| 60  | Dry                        | -                    |
| 70  | Impossible to knead        | -                    |
| 75  | Creamy                     | -                    |
| 80  | Creamy                     | 15                   |
| 90  | Slurry with good fluidity  | 20                   |

\* Setting time is determined by JIS R 5210 needle penetration method (slurry thickness 38mm). Distance between the slurry bottom and the needle is 25mm.

# Plant & Office Location / Contact



Aluminum Hydroxide as CCL flame retardant.



High Purity Alumina as a sapphire raw material.

## Contact for Sales and Technical Information (All Products)



Alumina Products Dept. / Functional Materials Dept.  
27-1, Shinkawa 2-chome, Chuo-ku, Tokyo, 104-8260, Japan  
TEL +81 3 5543 5321 FAX +81 3 5543 5912

Website : <http://www.sumitomo-chem.co.jp/english>  
Web-inquiry : [https://www.sumitomo-chem.co.jp/cgi-bin/toiawase\\_seihin\\_e/form.cgi](https://www.sumitomo-chem.co.jp/cgi-bin/toiawase_seihin_e/form.cgi)

## Contact for Activated Alumina/Hydraulic Alumina Sales

Sumika Alchem Co., Ltd.  
6-17, Koraihashi, 4-chome, Chuo-ku, Osaka  
541-0043, Japan  
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