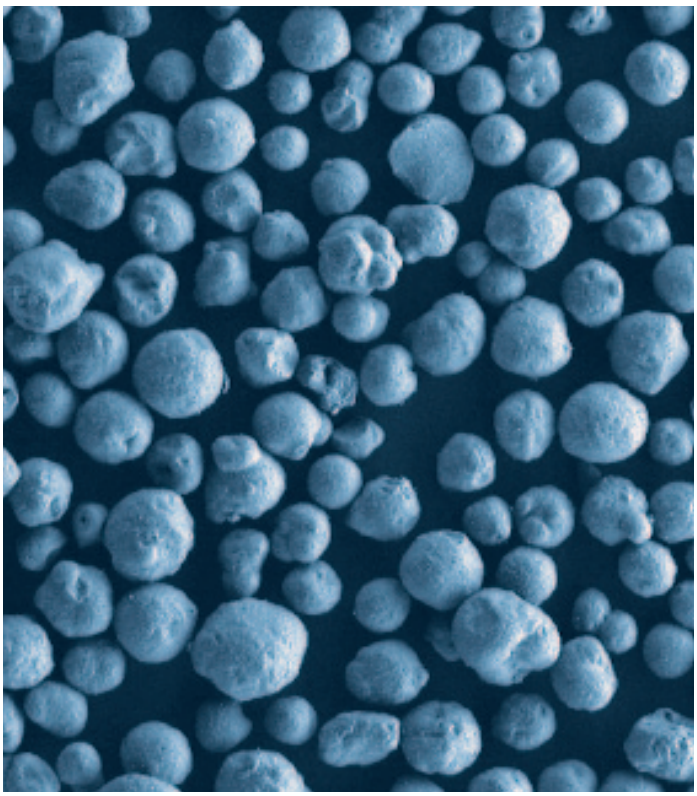
sasol
reaching new frontiers



PURALOX®/CATALOX®
High purity activated aluminas

PURALOX®/CATALOX®

High purity activated aluminas

PURALOX and CATALOX *are the trademarks for the aluminum oxides derived from the controlled activation of PURAL and CATAPAL high purity aluminas. PURAL and CATAPAL are the respective trademarks of synthetic, high purity boehmite alumina (alumina monohydrate AlOOH, and bayerite, $(Al(OH)_3)$ manufactured in Brunsbüttel, Germany and Lake Charles, USA. The proprietary process used in the preparation of these high purity aluminum oxides allows Sasol to control many important physical properties and hence "tailor-make" a product for your needs. Both PURALOX and CATALOX are available as white, free flowing powders with high purity and consistency. Due to the precisely controlled processing conditions during and after manufacturing these aluminum oxides, PURALOX and CATALOX make excellent starting materials for the catalyst industry. They provide excellent specific catalytic activities, high surface area stability, and low attrition loss.*

PURALOX and CATALOX *are arguably the best starting materials for the catalyst industry where consistency and an unobtrusive nature of the support is highly desired. These characteristics are of great importance for fluid and slurry bed reactions. Due to their high thermal stability, PURALOX and CATALOX are widely used raw materials for washcoat formulations in environmental emmission control catalysts. Recent developments have found other suitable uses for these materials in applications outside catalysis such as polishing and chromatography.*

Advantages of PURALOX and CATALOX

Unlike other alumina manufacturing processes which use less pure bauxite derivatives as a starting material, Sasol has pioneered a process based on aluminum alkoxide which produces synthetic boehmite aluminas of high purity. Examples of some trace impurities are shown in table 1.

Sasol produces aluminum oxides with a wide range of possible particle size distributions (figure 1).

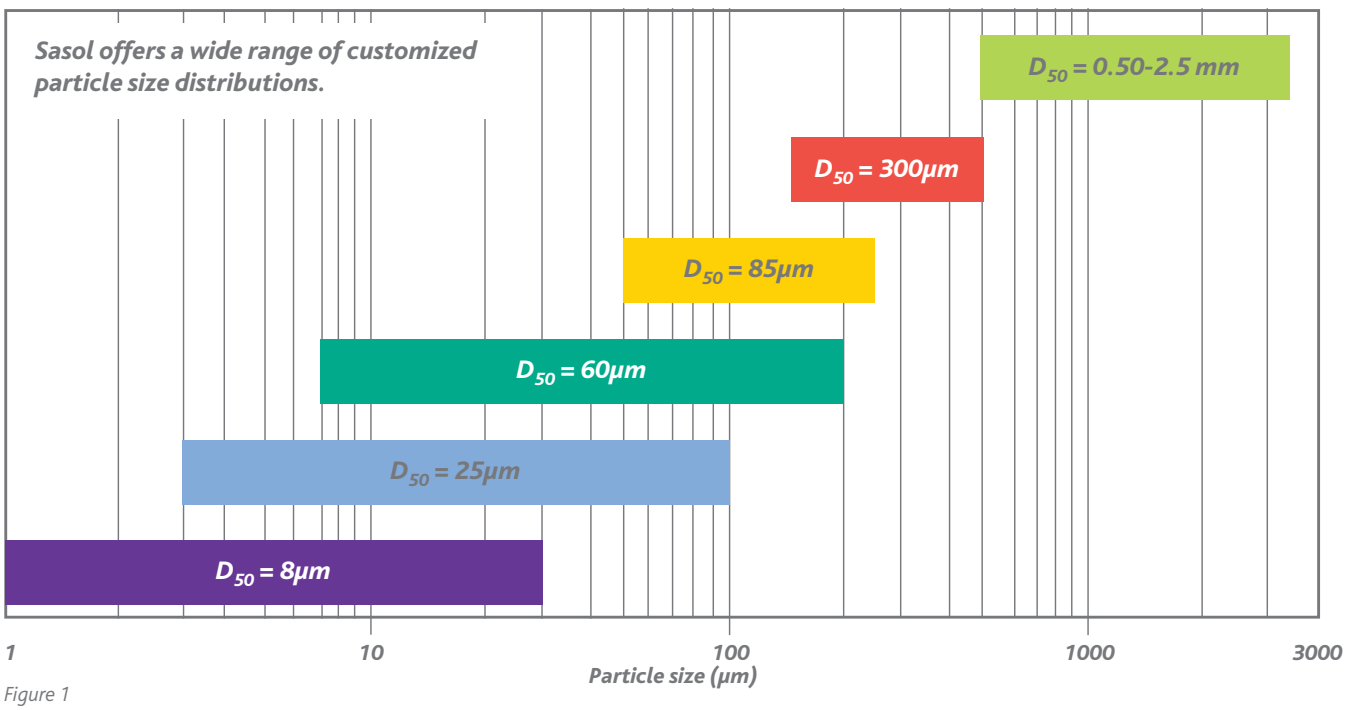


Figure 1

Areas of particle size distribution of PURALOX and CATALOX aluminas

The range of possible average particle sizes stretches from 8 micrometers to 2.5 millimeters. We have over 30 years experience in the production of specialty aluminas which allows us to control the physical properties such as the pore size distribution of the aluminum oxide during production. Figure 2 shows a graph of 3 different aluminum oxides produced by Sasol.

Table 1

Chemical purity of PURALOX and CATALOX aluminas

Impurity	ppm (typical)
Fe_2O_3	125
Na_2O	25
SiO_2	150

Other pore size distributions are available on request.

Processing of PURALOX and CATALOX alumina

The unique ability of Sasol to adjust certain physical properties makes the aluminas perfect for a variety of applications.

For example, particle size, surface area, and attrition resistance are key physical properties that can be tailored to meet your specific requirements.

Activation

The final crystalline phase of the activated alumina depends on the initial crystalline properties of the starting material as well as the activation process. Our activated aluminas are predominantly based on high purity boehmite as the starting alumina hydrate.

The phase transitions of boehmite are shown in figure 3 in the form of powder X-Ray Diffraction (XRD) patterns.

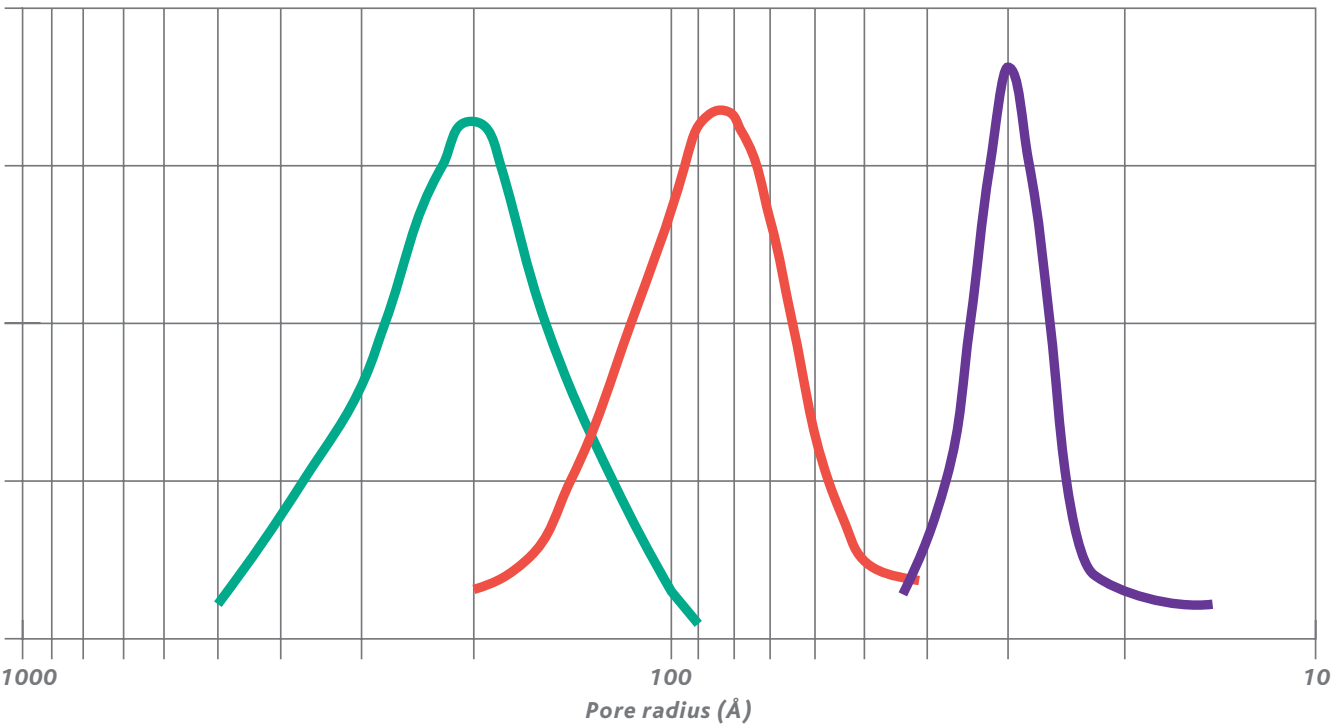


Figure 2
Pore size distribution of various activated aluminas

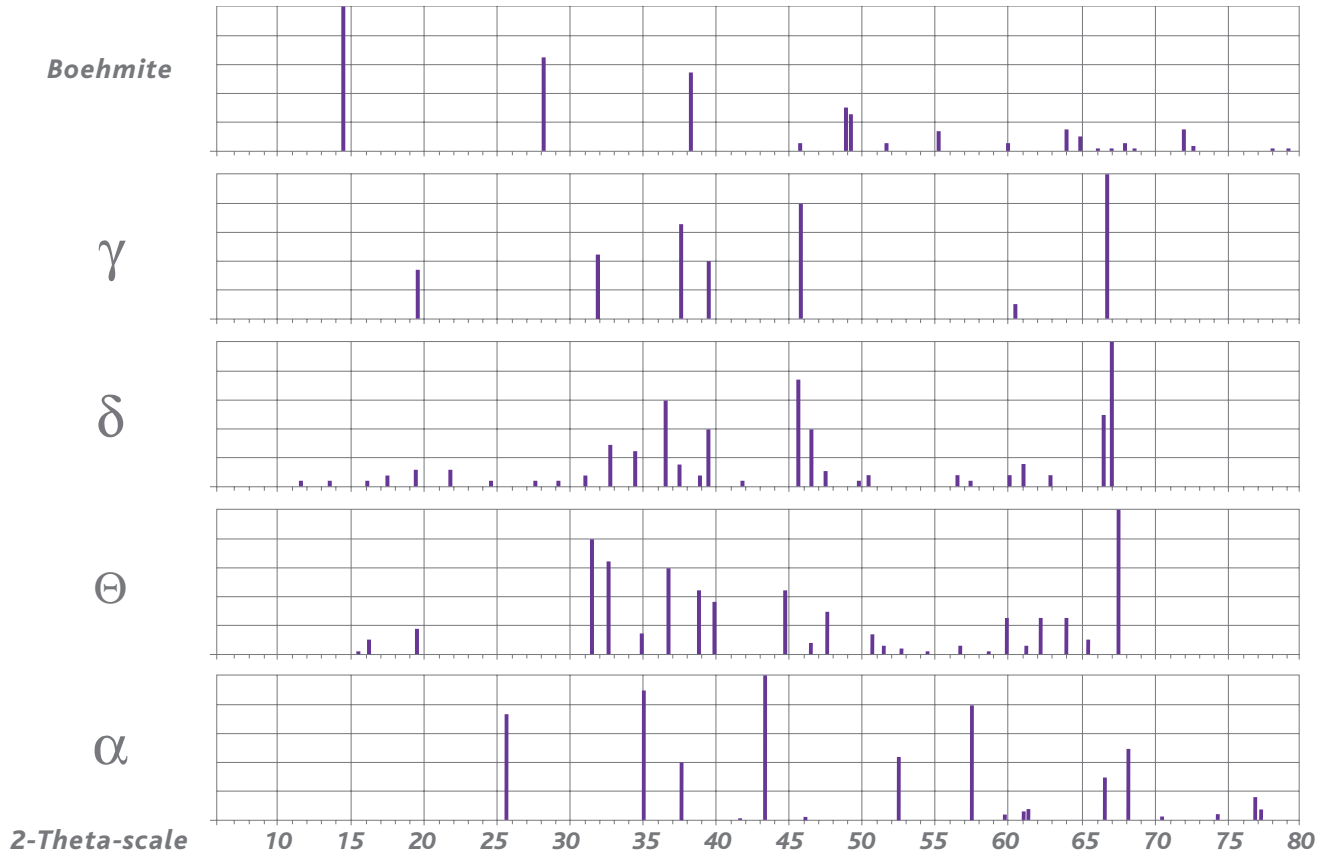


Figure 3
Powder XRD patterns of various alumina phases

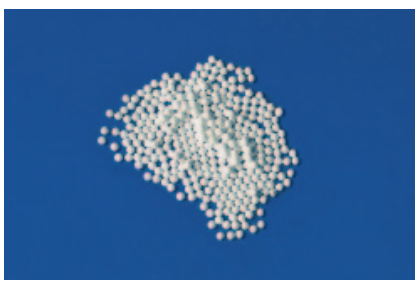
Typical activation temperatures of the boehmite lie within 600–1000°C. During such temperatures the physically and chemically bound water is removed, transforming the hydrate into an oxide.

However,the use of bayerite as the starting hydrate is also available upon request. The bayerite is produced with the same high purity characteristics as the boehmite.

Properties such as the crystalline phase, surface area and porosity can be altered significantly by varying the activation process. Figure 4 shows a graphic representation of the relationship between the surface area, pore volume and crystalline phase. Depending on the physical characteristics of the initial alumina hydrate Sasol is able to prepare aluminum oxides with various pore volumes. The data shown in figure 4 are by no means the only possibilities available.

Figure 5 shows the differential scanning calorimetry (DSC) of boehmite and bayerite indicating the different Al_2O_3-phase conversions and the corresponding conversion temperatures.

The Sasol organization also offers a family of ultra high purity alumina products marketed through Sasol North America Inc., CERALOX division, based in Tucson, Arizona, USA. The company specializes in ultra high purity alpha and gamma alumina products for high-tech industrial applications.



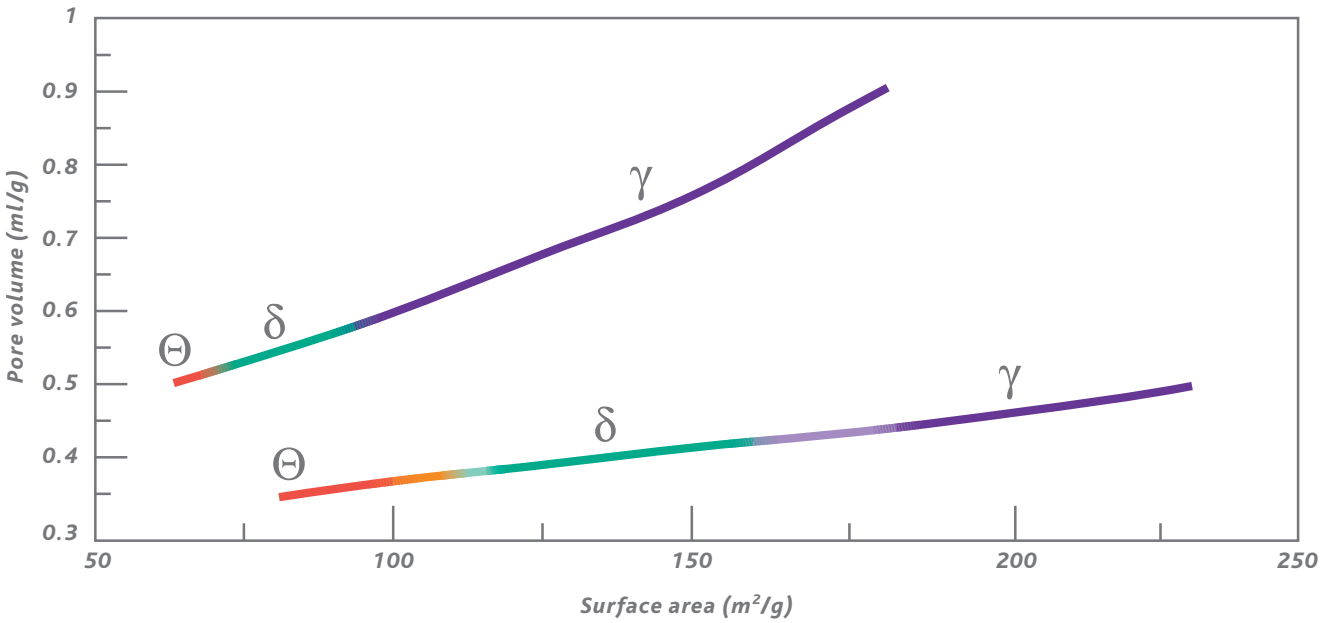


Figure 4

Example of the relationship between surface area,pore volume and crystal phase

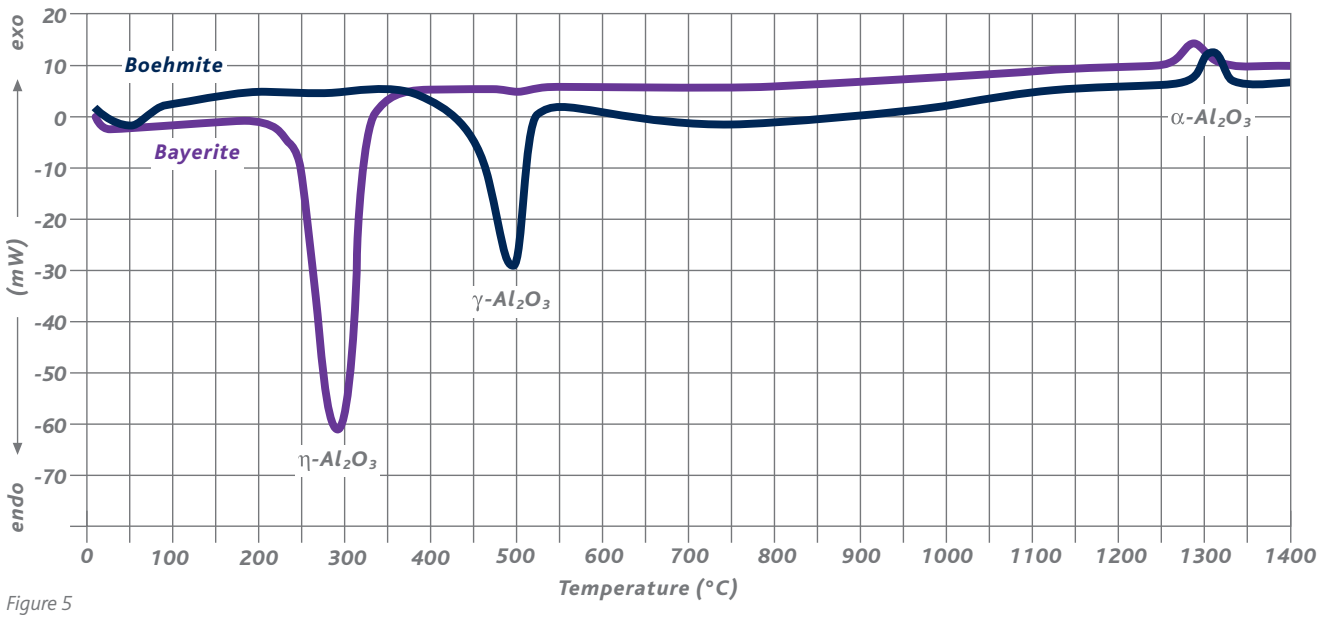


Figure 5

DSC of boehmite and bayerite aluminas

Safety and handling

PURALOX and CATALOX aluminas are classified as a non-toxic, non-flammable, nuisance dust. Exposure to high concentrations of dust may cause physical irritation. Repeated or prolonged exposure with skin may result in dryness and irritation.

Handling procedures should be designed to minimize inhalation and skin exposure. Normal good house keeping and operating procedures should ensure personnel safety.

Storage and transfer

PURALOX and CATALOX aluminas are dry, pure aluminum oxides, however, since all aluminas adsorb atmospheric moisture, facilities should be designed to avoid excessive exposure to moist air. By excluding moisture from the storage of alumina, shelf life is extended. PURALOX and CATALOX are abrasive materials.

Therefore, handling and storage equipment should be abrasion resistant carbon steel, aluminum or polypropylene lined steel.

Technical support

Sasol is committed to customer satisfaction and we offer a full range of technical support to complement the products.

Technical sales and support is available worldwide to help you choose the right alumina for your end use, as well as to provide guidance on the aluminas' safe and efficient handling.

The products described in this brochure are small indications of our capability. We look forward to discussing specific technical requirements with you in detail so that together we can develop unique products for your application.

Analytical methods

Trace element analysis *Alumina powder is quantitatively brought into solution by using acids and then analyzed by ICP, atomic emission. Additionally, X-ray fluorescence spectroscopy is used.*

Crystallite type and average crystal size *Powdered samples of the alumina are analyzed by using X-Ray Diffractometry (XRD) on either a Siemens D5000 or a Philips X'Pert diffractometer. The resulting diffractogram enables the laboratory to identify the crystal structure of the material.*

Particle size distribution *The particle size distribution of alumina may be measured by various instruments, namely, Cilas Granulometer 1064 supplied by Quantachrome, Malvern Mastersizer or Luftstrahlsieb (air sieve) supplied by Alpine.*

Surface area analysis *The surface area of the alumina is measured by using an instrument supplied by Quantachrome (Nova series) or by Micromeritics (Gemini series). The method entails low temperature adsorption of nitrogen at the BET region of the adsorption isotherm.*

Pore size distribution *The pore size of our products is measured by two different methods. Measurement may be performed by either mercury intrusion or by nitrogen desorption. Nitrogen desorption, with instruments from Quantachrome, is used to find the pores from 2 to 30 nm while the mercury intrusion is used to obtain the pores between 5 to 500 nm using an Micromeritics Autopore instrument.*

Differential scanning calorimetry (DSC) *Netzsch STA 449C Jupiter, Setaram 92 or Perkin Elmer instruments may be used with a selected heating rate to obtain the exothermic and endothermic transitions of alumina. Additional test methods are available for other physical properties upon request.*

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PURALOX CATALOX 01/03 GB

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reaching new frontiers

Product information

PURALOX®, CATALOX® *Aluminum oxides (gamma-delta-theta phase)*

High purity activated aluminas

Typical chemical and physical properties		***PURALOX/ CATALOX SBa Series***	***PURALOX/ CATALOX SCFa Series***	***PURALOX/ CATALOX SCCa Series***	***PURALOX NGa Series***	***PURALOX TH 100/150***	***CATALOX HTa HTFa 101***	***PURALOX SCFa-140 L3***
Al_2O_3	[%]	98	98	98	98	98	96	95
Na_2O	[%]	0.002	0.002	0.002	0.002	0.002	0.002	0.002
La_2O_3	[%]	—	—	—	—	—	—	3
L.O.I.	[%]	2	2	2	2	2	4	2
Loose bulk density	[g/l]	500–800	500–800	600–850	400–750	300–500	200–350	500–700
Packed bulk density	[g/l]	700–1000	800–1000	700–1150	700–950	700–950	350–650	700–1000
Particle size (d_{50})	[µm]	45	25	60-150*	35	40	15-40 (HTa) 5-10 (HTFa)	30
Range of surface area (BET)**	[m^2/g]	90-210	90-210	90-210	80-160	150	75-115	140
Pore volume	[ml/g]	0.35-0.50	0.35-0.50	0.35-0.50	0.35-0.45	0.80-1.0	0.70	0.50
Pore radius	[nm]	4–10	4–10	4–10	4–10	11	12–17	8
Thermal stability								
Surface area: 24h/1100°C	[m^2/g]	15	15	15	6	80	40	80
Surface area: 24h/1200°C	[m^2/g]	5	5	5	4	20	5	40

Chemical purity: C: 0.05 %, SiO_2: 0.01–0.015%, Fe_2O_3: 0.005–0.015 %, TiO_2: 0.01–0.30 %
**Figures show the range of particle size distribution (d_{50}) available upon request*
***Figures show the range of surface areas (+/- 10m^2/g) available on request*

Further specialty grades are available upon request

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