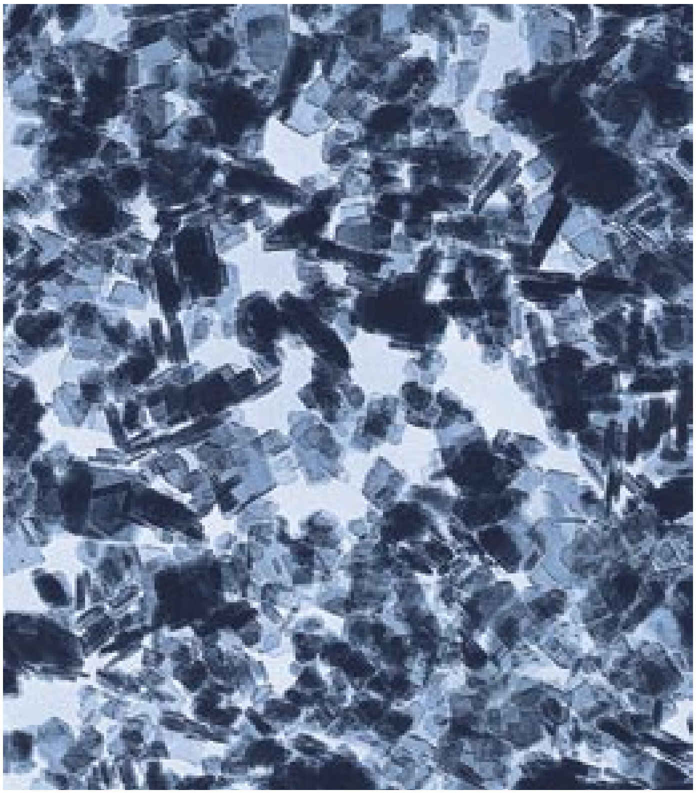

PURAL®/CATAPAL®
High purity aluminas

PURAL®/CATAPAL®

High purity aluminas

PURAL and CATAPAL *are the respective tradenames for the high purity boehmite aluminas manufactured in Brunsbüttel, Germany and Lake Charles, Louisiana, USA. PURAL and CATAPAL are available as white, free flowing powders whose unique combination of purity and controllable physical properties make them excellent starting materials for many products. This family of aluminas (alumina monohydrates, AlOOH, and bayerite, $Al(OH)_3$) has been used as supports or binders for catalysts in refinery and chemical processes. Recent developments in many other applications have indicated these aluminas have applications in areas far beyond catalysis.*

Advantages of PURAL and CATAPAL aluminas

Sasol pioneered processes to convert aluminum metal to synthetic boehmite aluminas of high purity. Unlike other alumina manufacturing processes that start with bauxite derivatives, our processes yield aluminas with significantly lower levels of common impurities such as iron, sodium and silica (as shown in table 1). Additionally, our 30 years of alumina manufacturing experience allows us to control and adjust physical properties such as surface area and porosity (figure 1), particle size (figure 2) and peptization behavior (figure 4) so that our customers are not limited in their thinking for possible uses for the aluminas.

Table 1

Chemical purity of PURAL and CATAPAL alumina powders

Impurity	ppm (typical)
Na_2O	20
Fe_2O_3	100
SiO_2	120

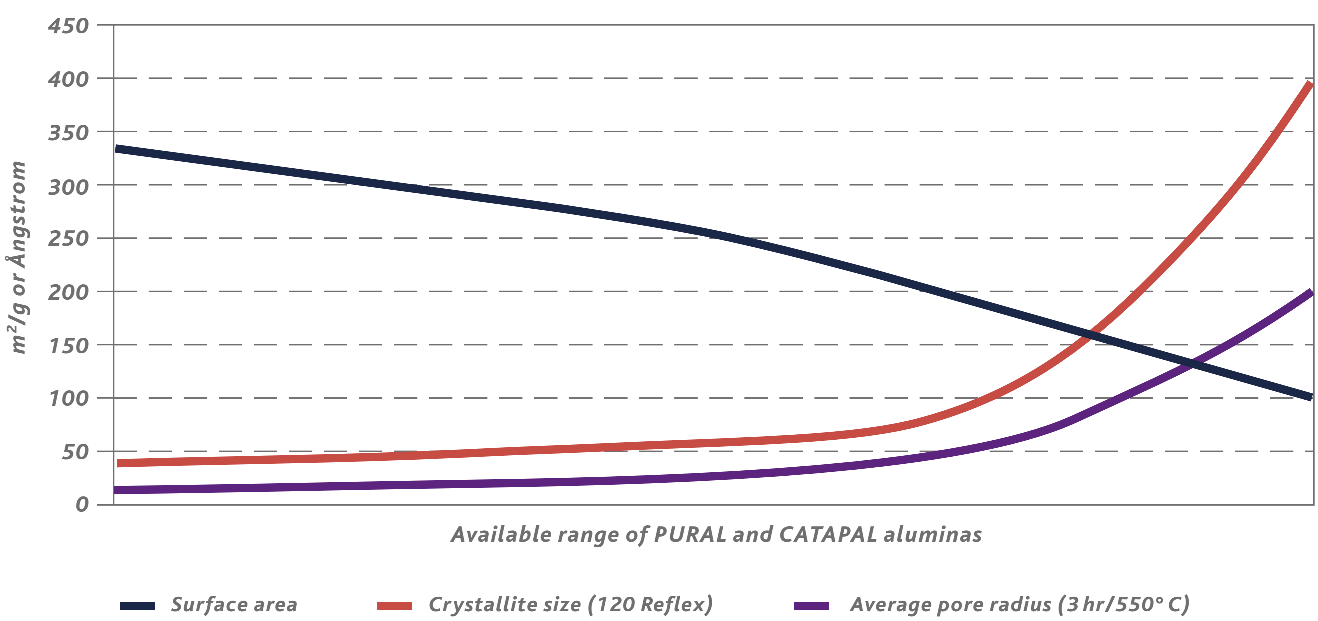

Figure 1
Relationship between crystallite size, average pore radius and surface area

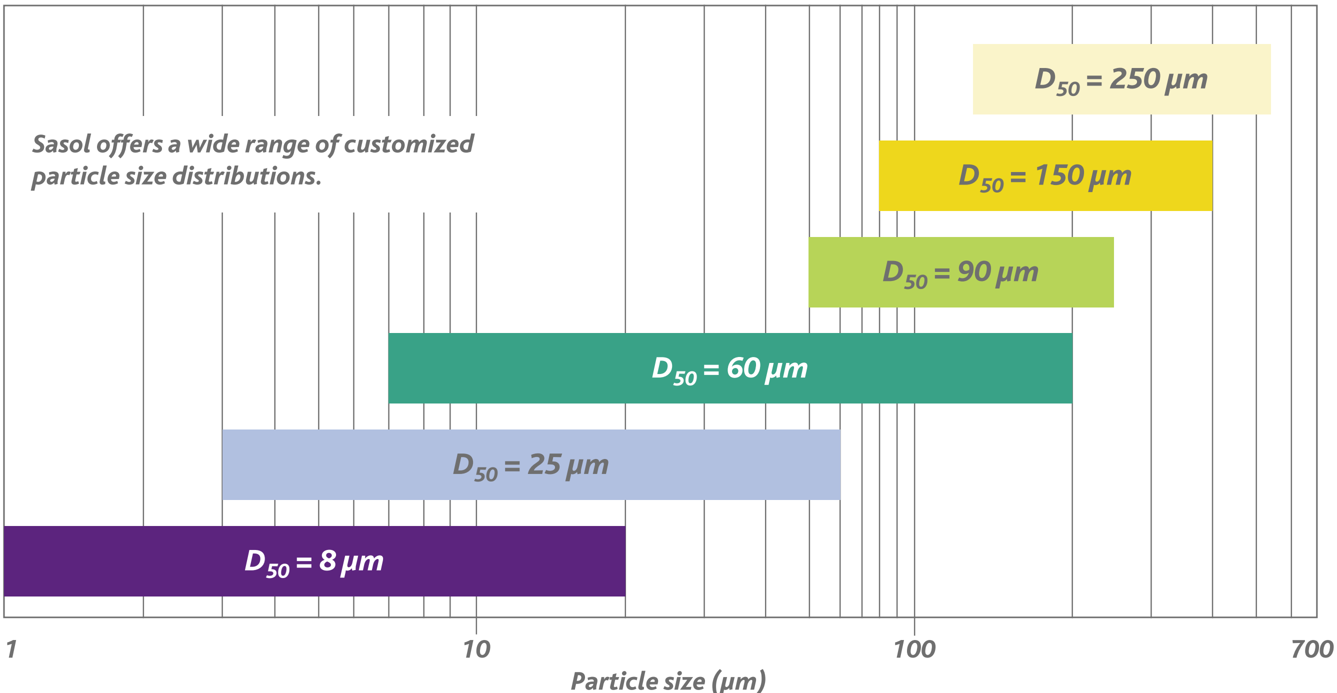

Figure 2

Examples of particle size distributions of PURAL and CATAPAL aluminas

Figure 3

Sasol aluminas of different particle size

Processing of PURAL and CATAPAL aluminas

The unique ability to adjust the physical properties of the aluminas make them perfect for a variety of different end use applications requiring different types of processing.

Extrusion behavior

Extrusion is a key use for these types of aluminas due to their ability to form excellent extruded supports. This application takes advantage of the aluminas' ability to peptize in the presence of organic/inorganic acids. A wide variety of extrudate properties can be obtained by using different grades of PURAL and CATAPAL aluminas and by controlling the formulation and extrusion variables. Optimum formulations depend on the exact choice of mixer, extruder and alumina properties. General extrusion guidelines can be recommended by our technical staff.

Our unique ability to adjust the aluminas' peptization behavior means that the gelling behavior of PURAL and CATAPAL can be modified to supply an alumina optimized for our customers own unique set of processing conditions. Nitric acid gelation time (NAG) is a valuable tool for selecting the right alumina for your processing conditions.

"NAG" is the time required for a concentrated dispersion of alumina to reach a certain viscosity by peptization. This behavior is shown in figure 4 and illustrates the range of alumina NAGs we are able to produce on our customers' request. The graph is not meant to indicate the only NAGs available.

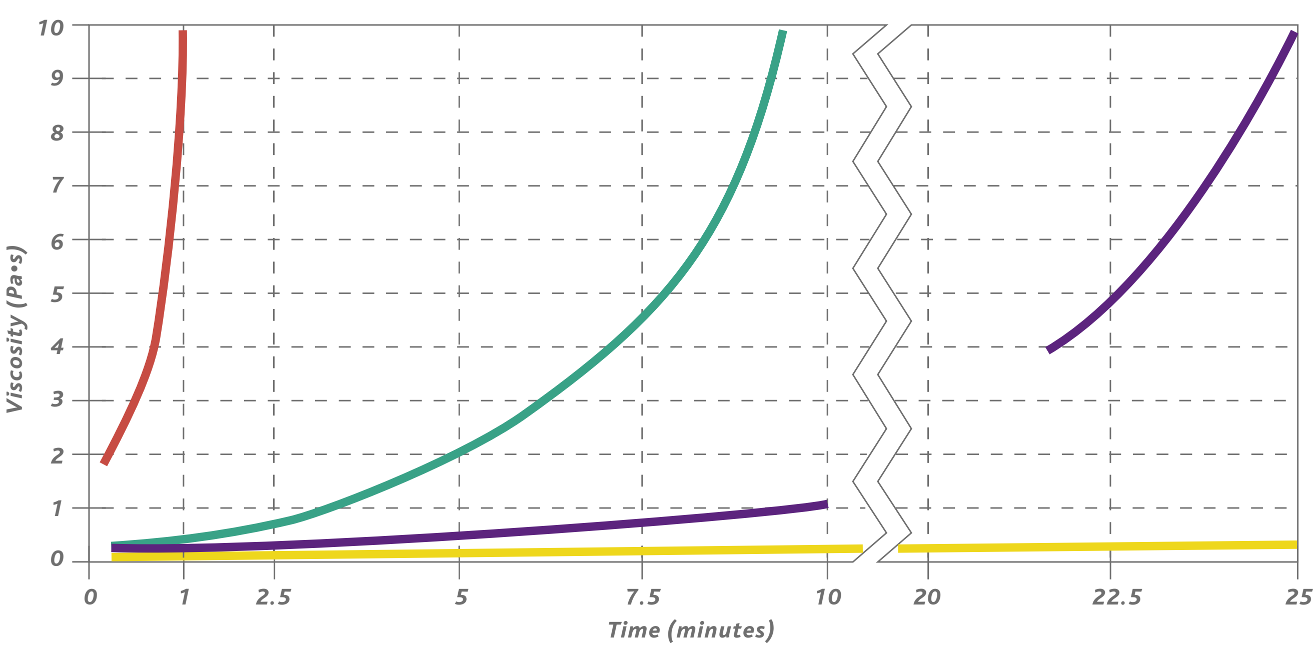

Figure 4
Viscosity behavior of alumina dispersions having different NAG values

Calcination

The final crystalline phase or structure of calcined aluminas depends on the initial crystalline properties of the starting alumina as well as the calcination temperature. The Sasol aluminas are initially in the boehmite or bayerite structure and follow the dehydration sequence shown in figure 6.

Physical properties such as crystalline phase, surface area, and porosity can be altered significantly by varying the calcining time and temperature. Calcining temperatures are typically between 600°C and 1000°C. This process results in the loss of physically and chemically adsorbed water. Figure 6 shows the typical phase transitions.

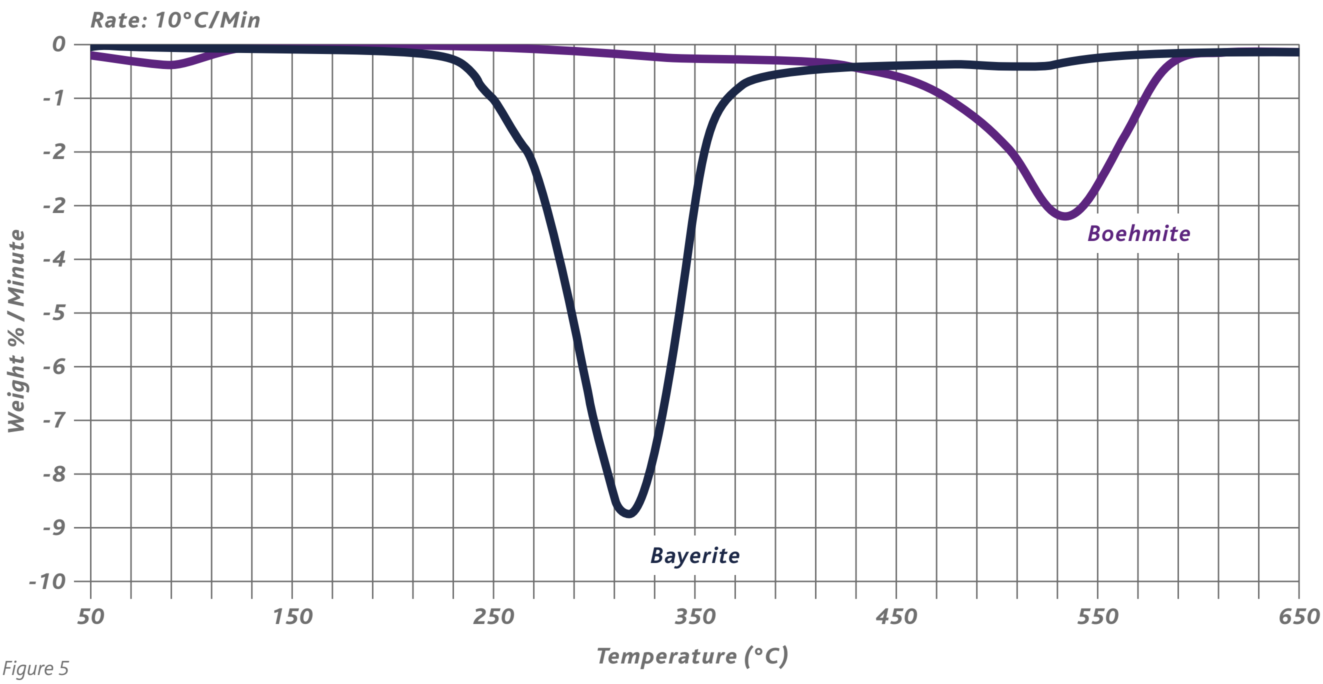

Figure 5
Thermogravimetric Analysis (TGA) of typical boehmite and bayerite samples
Phase transitions occur at different temperatures for different products

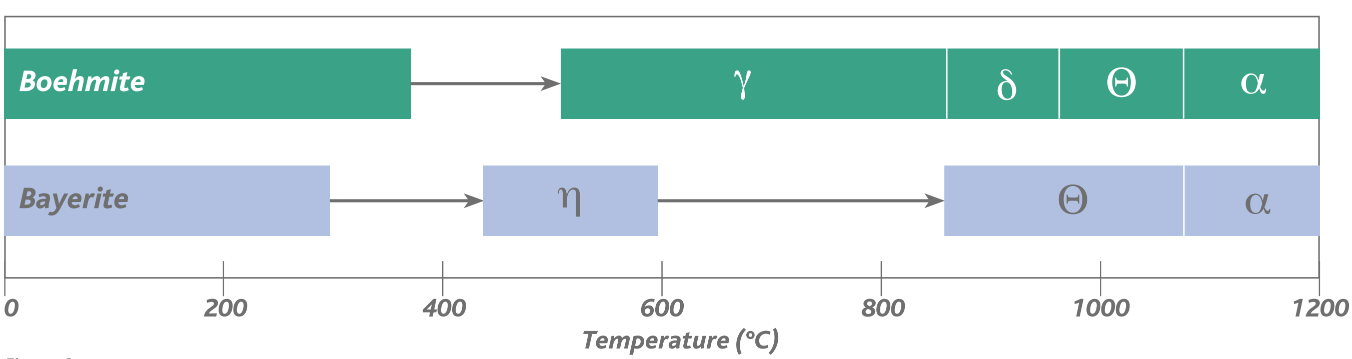

Figure 6
Dehydration sequence of alumina hydrates

Storage and transfer

PURAL and CATAPAL aluminas are mildly abrasive materials with a Mohs hardness of 3.5 to 4.0. Therefore, handling and storage equipment should be abrasion resistant carbon steel, aluminium or polypropylene lined steel are recommended. Blower or vacuum systems are typically used to move the product. A minimum of 4,000 ft/min fluidizing velocity is recommended. Since alumina will adsorb atmospheric moisture facilities should be designed to avoid moist air contact with alumina.

Safety and handling

PURAL and CATAPAL aluminas are classified as a non-toxic, nuisance dust. Exposure to high concentrations of dust may cause physical irritation.

Repeated or prolonged contact with skin may result in drying and irritation. Handling procedures should be designed to minimize inhalation and skin exposure. Normal good house-keeping and operating procedures should ensure personnel safety.

Technical support

Sasol has made a significant commitment 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 choose the right alumina for your end use, as well as to provide advice on the aluminas' safe and efficient use.

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

Tests on PURAL and CATAPAL

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 Powder 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 nitrogen adsorption at the BET region of the adsorption isotherm.

Pore size distribution*
The pore size distribution of our products is measured by nitrogen desorption using Autosorb instruments supplied by Quantachrome.

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.

Nitric acid gelation (NAG)
200 g of alumina is dispersed in 234,5 g of distilled water and is then stirred for exactly 3 minutes. 98 ml of 3.93% nitric acid is then quickly added under stirring to create a 37.5 weight% dispersion. The viscosity of the dispersion is then measured. The NAG value is defined as the time required for the dispersion to gel to 9500 mPa·s from the time that the acid is added.

Additional test methods are available for other physical properties upon request.

* After alumina activation at 550°C for 3 hours.

Sasol Germany GmbH
Anckelmannsplatz 1, 20537 Hamburg, Germany
Telephone +49 40 63 684 1245 Facsimile +49 40 63 684 3626
inorganic@de.sasol.com www.sasolalumina.com

Sasol North America Inc.
900 Threadneedle, PO Box 19029, Houston, Texas 77224-9029, USA
Telephone +1 281 588 3406 Facsimile +1 281 588 3067
info@us.sasol.com www.sasolnorthamerica.com

Sasol Japan KK
PO Box 46 St. Luke's Tower 35 F, 8-1 Akashicho, Chuo-ku,
Tokyo 104-6591, Japan
Telephone +81 3 3248 6711 Facsimile +81 3 3248 6715
adm@sasoljapan.com

www.sasolalumina.com

PURAL® CATAPAL® 02/07 GB

Product information

PURAL®, CATAPAL® Boehmite

High purity aluminas

Typical chemical and physical properties	CATAPAL B	PURAL SB	PURAL SB1	CATAPAL C1	CATAPAL D	PURAL SCF	PURAL SCC	PURAL NG	PURAL NF	PURAL 200	CATAPAL 200	PURAL BT*
Al_2O_3 [%]	72	74	74	72	76	74	74	77	77	80	80	64
Na_2O [%]	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
Loose bulk density [g/l]	670–750	650–850	600–750	670–750	700–800	500–700	700–850	400–600	350–500	500–700	500–700	500–700
Packed bulk density [g/l]	800–1100	800–1100	800–1100	800–1100	800–1100	800–1100	850–950	700–900	600–800	700–900	700–800	600–800
Particle size (d_{50}) [µm]	60	45	45	60	40	25	60–150 1)	35	15	40	40	5–10
Surface area (BET)** [m^2/g]	250	250	250	230	220	250	250	170	170	100	100	360***
Pore volume** [ml/g]	0.50	0.50	0.50	0.50	0.55	0.50	0.50	0.45	0.45	0.70	0.70	0.30***
Crystallite size [120] [nm]	4.5	5.0	5.0	5.5	7.0	5.0	5.0	10	10	40	40	40****

Chemical purity: C: 0.25 %, SiO_2: 0.01–0.015%, Fe_2O_3: 0.005–0.015 %, TiO_2: 0.01–0.20 %

*Bayerite
**After activation at 550°C for 3 hours
***After activation at 350°C for 3 hours
****Reflex 331/Bayerite
1) Figures show the particle size distribution (d_{50}) available upon request

Further specialty grades are available upon request

Status: 02/2007

Sasol Germany GmbH
Anckelmannsplatz 1, 20537 Hamburg, Germany
Telephone +49 40 63684 1245   Facsimile +49 40 63684 3626   inorganic@de.sasol.com   www.sasolalumina.com

Sasol North America Inc.
900 Threadneedle, PO Box 19029, Houston, Texas 77224-9029, USA
Telephone +1 281 588 3406   Facsimile +1 281 588 3067   info@us.sasol.com   www.sasolnorthamerica.com

Sasol Japan KK
PO Box 46 St. Luke's Tower 35 F, 8-1 Akashicho, Chuo-ku, Tokyo 104-6591, Japan
Telephone +81 3-3248 6711   Facsimile +81 3 3248 6715   adm@sasoljapan.com

www.sasolalumina.com