We create chemistry

High Performance Alumina Pseudoboehmite Powders

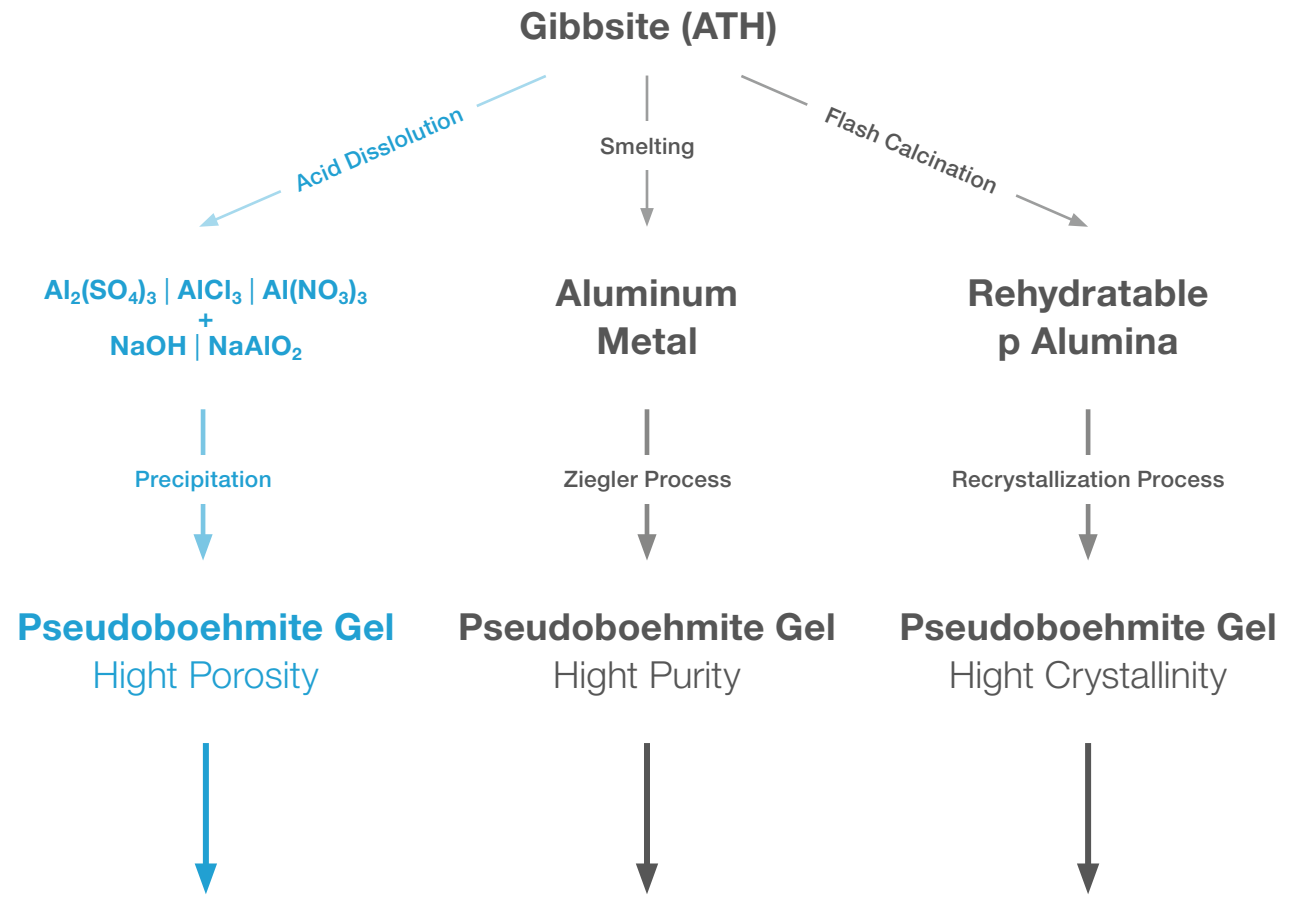
Designed to meet your alumina needs.

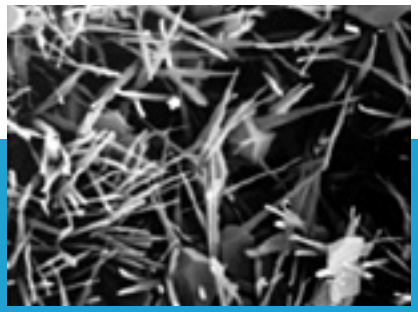
Alumina Pseudoboehmite Powders
Versatility in Properties and Applications

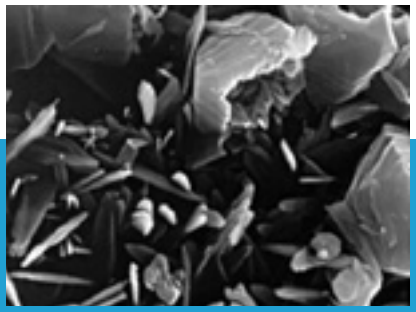
BASF Pseudoboehmites are high quality alumina powders produced to meet stringent standards in variety of applications in chemical, ceramics and other related industries. Pseudoboehmites are used in manufacturing of catalysts supports, binders, abrasives, polishes, automotive wash coats and ceramic coatings.

Our materials expertise along with long history of commercial applications allows to deliver best in class solution for specific customer needs. Alumina Pseudoboehmite properties are customizable offering unique opportunity to tailor key parameters such as surface area, porosity, bulk density, acidity and particle size.

From Gibbsite to Alumina Pseudoboehmite Powder





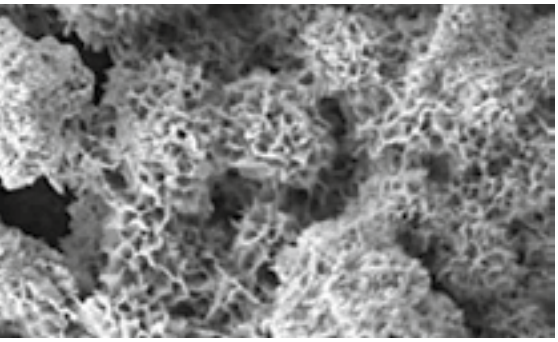


Different aluminas are chosen based on their different properties and applications. Properties such as porosity, purity, surface area, and density should be considered when choosing an alumina.

Alumina Pseudoboehmite Powder
Product Portfolio

PAL M Series

These are high performance pseudoboehmite aluminas produced as dry white powders with excellent flowability and fluidization properties.

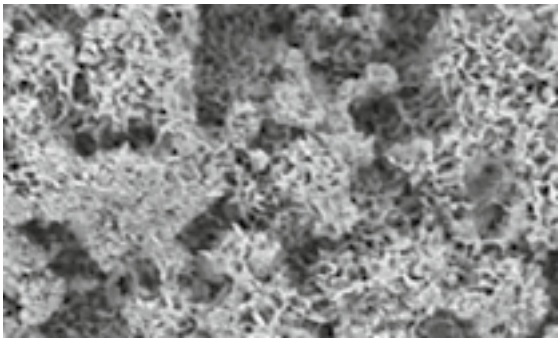


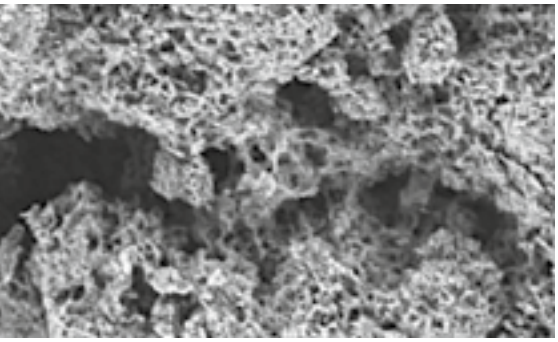
PAL M-300

PAL M-300 is a high porosity, medium density alumina designed for applications in catalysts and ceramics manufacturing. It is peptized by acids and has good flowability when used in formed products manufacturing. Typically, formed products produced with PAL M-300 are characterized by high macroporosity and high mechanical strength. High pore volume combined with high surface area make PAL M-300 suitable for use in adsorption and purification.

PAL M-400

PAL M-400 is a medium porosity, high density alumina formulated for applications where higher density is required. It is characterized by slightly larger particle and crystallite sizes than normally obtained in PAL M-300. PAL M-400 is well suited for applications in abrasives, polishers, ceramics, polymer additives, and fillers. It has favorable forming properties and used as matrix component or binding agent in shaped products.





PAL HP-150

PAL HP-150 is a high purity, medium density alumina characterized by high resistance to peptization and relatively high chemical inertness. Its unique characteristics include exceptional purity, low reactivity and high robustness. Particles of PAL HP-150 are built out of densely packed alumina agglomerates stable under highly acidic conditions.

Product Overview, Typical Characteristics

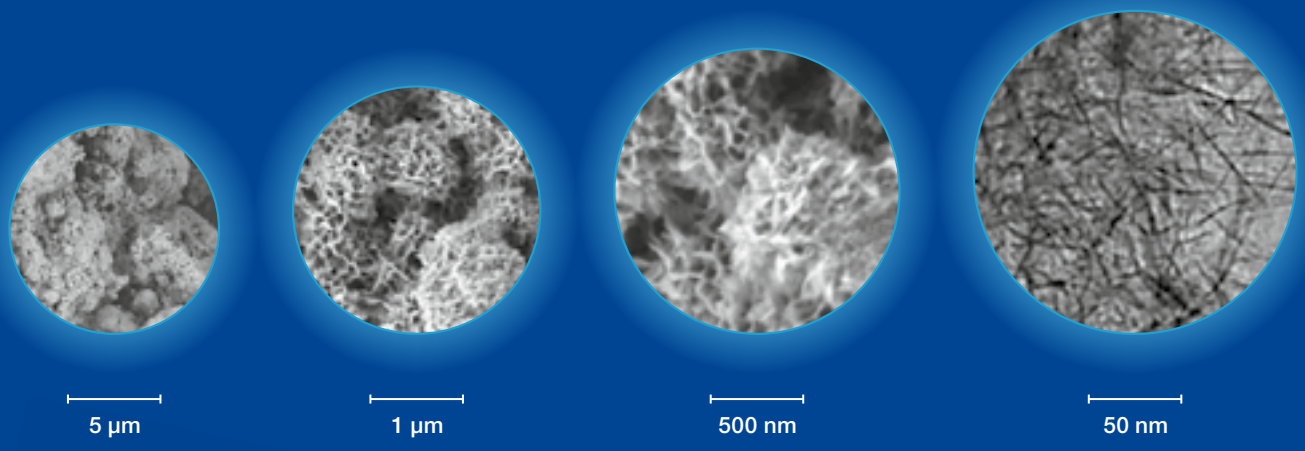
Physical Properties	PAL M-300	PAL M-400	PAL HP-150
Surface Area, m^2/g (1 hr at 550°C)	300	320	260
Bulk Density, kg/m^3	480–530	650–750	600
N2 Pore Volume, cc/g (1 hr at 550°C)	0.80	0.65	0.60
Alumina Phase	Pseudoboehmite	Pseudoboehmite	Pseudoboehmite
Particle Size d50, microns	20–26	25–40	12–16
Dispersibility Index, %	20	20	0
Chemical Composition, typical			
Al_2O_3, %	70	70	70
Na_2O, %	<0.04	<0.02	<0.02
SiO_2, %	<0.02	<0.03	<0.01
Fe_2O_3, %	<0.02	<0.03	<0.01
Cl, %	0	0	<0.1
SO_4, %	<0.25	<0.45	0
LOI, %	30	30	30
Particle Size Distribution			
D10, microns	4	15	3
D50, microns	22	35	12
D90, microns	63	75	24

Established Manufacturing Expertise for High Performance Pseudoboehmites

BASF is utilizing Acid-Base precipitation to produce Alumina Pseudoboehmites. Manufacturing process involves neutralization of aluminum salts such as sulfate or chloride with sodium hydroxide or sodium aluminate. Adjusting precipitation conditions such as pH, temperature, aging time allows to control properties of resulting Pseudoboehmites and tailor the surface chemistry. Pseudoboehmite phase is normally poorly crystalline. Unique set of synthesis conditions implemented in manufacturing process results in alumina with optimized structural characteristics that make Boehmites suitable for variety of applications including catalyst intermediates, polishers and abrasives.

Structural Properties
of Alumina Pseudoboehmites

Morphology of Pseudoboehmite crystals and the matrix density are important characteristics that affect dispersibility and thermal conversion properties of Boehmite. PAL M-300, PAL M-400 and PAL HP-150 aluminas exhibit spherical particle shape with d50 of 12–40 microns which consist of smaller irregularly packed agglomerates. Sponge-like entities are clearly visible at 500 nm resolution which is typical for precipitated Pseudoboehmites. Further magnification shows that primary crystallites are fibrils-like shaped and approximately are 15–60 nm long. Density of the matrix varies across the products with HP-150 being the most dense. Dense packing of alumina agglomerates in PAL HP-150 particles provides high resistance to peptization with mineral acids. In contrast, PAL M-300 and PAL M-400 products are characterized by more porous packings and are specifically designed to be partially dispersible in acidified aqueous solutions.

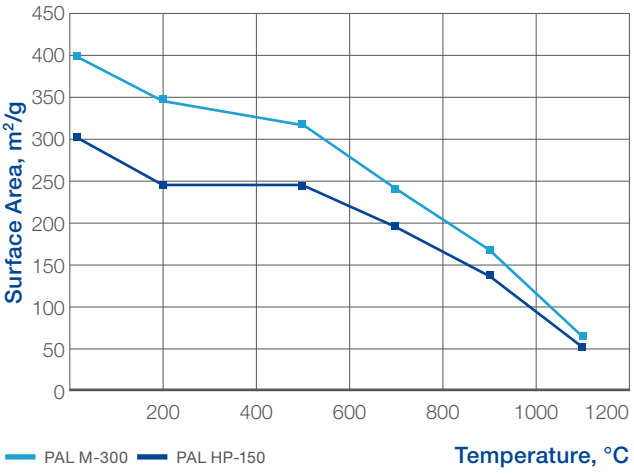


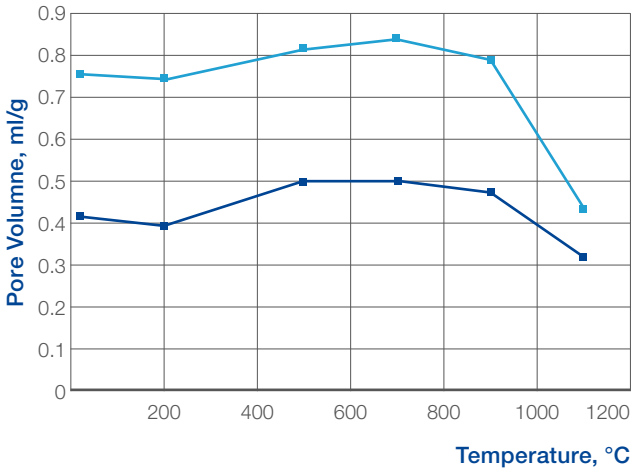
Alumina Thermal Chemistry
Surface Area and Pore Volume

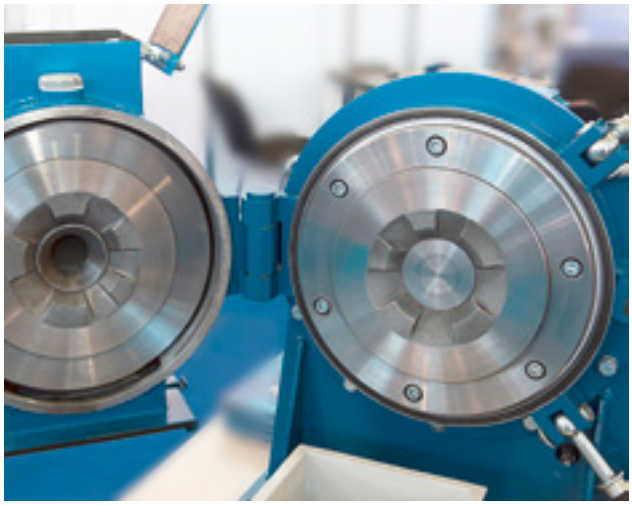
As alumina Pseudoboehmite phase-transitions upon thermal exposure, surface area and porosity characteristics are also changing. If not subject to any thermal exposure (but only mild dehydration), surface areas for PAL M-300 and PAL HP-150 are in vicinity of 400 m^2/g and 300 m^2/g, correspondingly. Conversion to gamma phase at 500–550 °C are accompanied by extensive dihydroxylation and decrease in surface area to ~300 and 250 m^2/g. Further temperature increase results in almost linear decline of surface areas and diminishing surface area difference for both products.

Transition to alpha-phase at 1100 °C and above yields alumina with surface area below 50 m^2/g (depending on temperature used).

Changes in porosity characteristics of PAL M-300 and PAL HP-150 alumina powders upon thermal exposure are consistent with behavior normally observed for transitional aluminas. Substitutional decline in pore volume is observed only after ~900 °C when alumina crystals sintering prevails as conversion to alpha becomes pronounced.





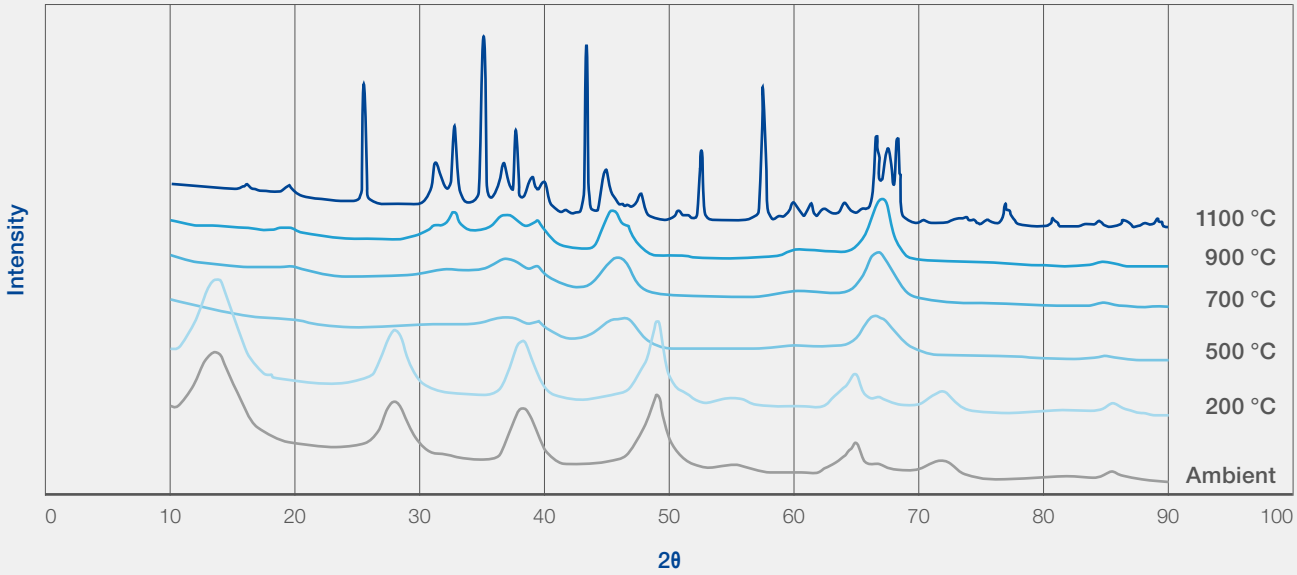


Alumina Thermal Chemistry
Phase Transformations

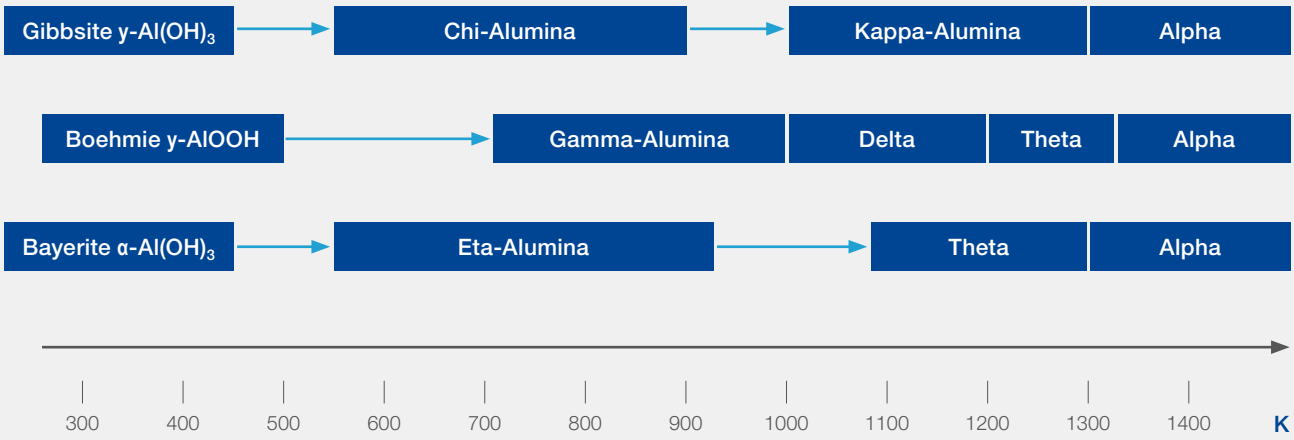
Thermal conversion behavior of Pseudoboehmites is an important characteristic which defines properties of derived materials if those were subject to thermal exposure. In accordance with the classical alumina phase transition scheme as temperature increases Boehmite converts to $\gamma \rightarrow \delta \rightarrow \theta \rightarrow \alpha$.

Ambient temperature spectrum is characteristic of alumina pseudoboehmite phase which remains stable at least up to 250–300 °C. Transition into gamma (γ) occurs in 450–500 °C region and high purity gamma phase is obtained after calcining at up to 700 °C. Increasing temperature to 900 °C results in formation of delta (δ) phase. Above 1100 °C alpha-phase dominates (traces of theta (θ) could be visible depending on exact temperature used).

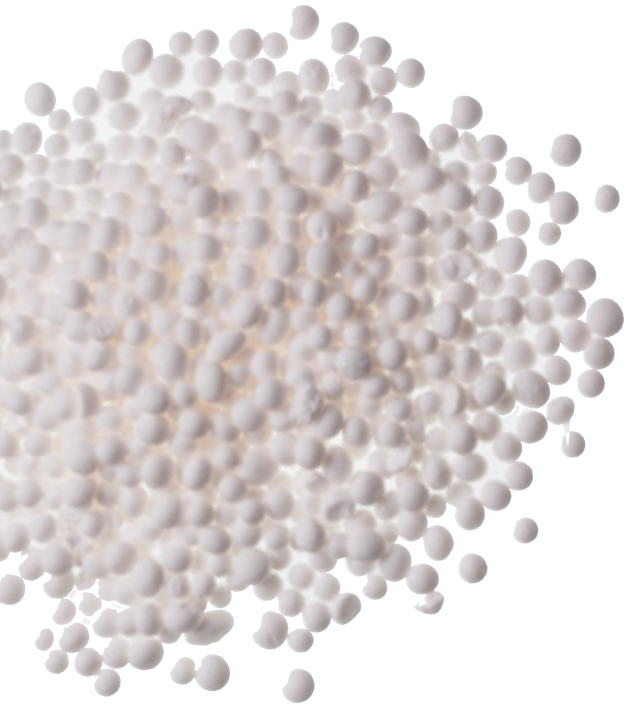
Phase Transformations of PAL M-300 Pseudoboehmite



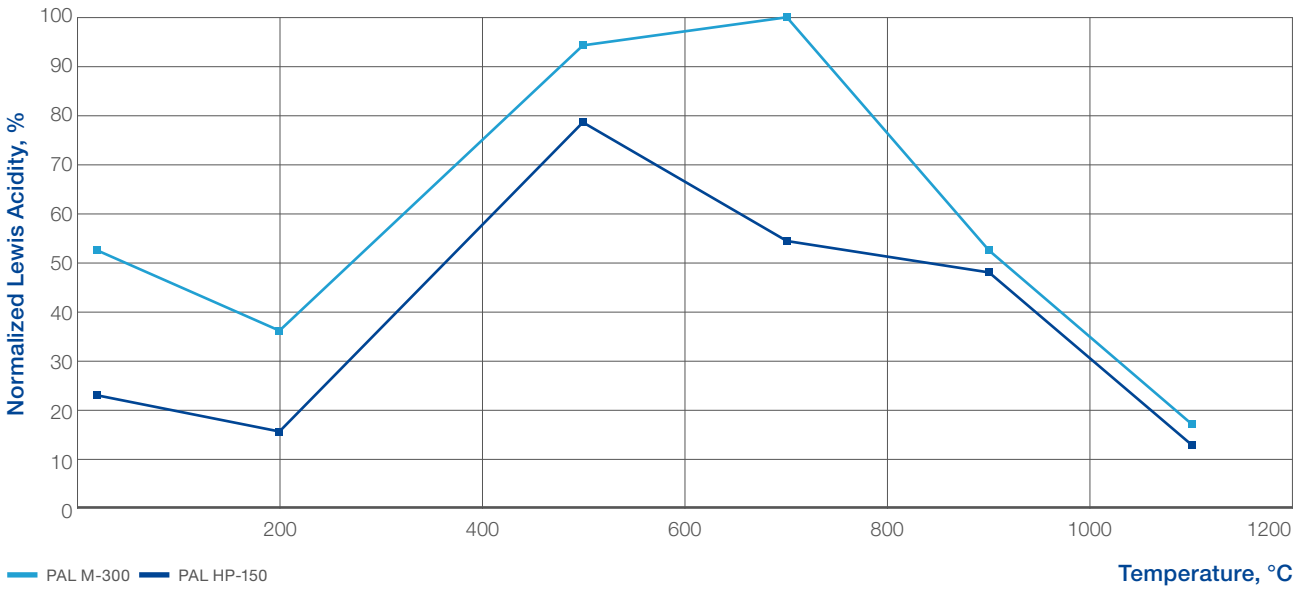
Phase Transformations of Alumina



Alumina Thermal Chemistry
Surface Acidity



Acidity of alumina surface needs to be considered when Pseudoboehmites are used in production of catalysts, additi-es or related products where alumina reactivity could contribute to overall performance. Alumina is normally characterized by Lewis acidity while the quantity and strength of Lewis acid sites vary depending on number of factors including phase composition, impurities etc. Total quantity of strong Lewis acid sites (normalized) varies with temperature and for PAL M-300 and PAL HP-150 exhibits volcano-shaped curve. While the overall trend of rising and declining acidity due to Boehmite → γ → α conversion is similar, PAL M-300 in general is more acidic than PAL HP-150.



Alumina Pseudoboehmites
Dispersibility and Forming Properties

Alumina Pseudoboehmite water solutions is an important characteristic which defines alumina response to acids and ability of primary alumina agglomerates to break up into smaller particles that remain suspended in aqueous solutions without precipitation. Dispersibility Index is used to quantify alumina ability to disperse in acidified solutions.

Product	Dispersibility Index, %
PAL M-300	20–22
PAL M-400	18–20
PAL HP-150	0

PAL M-300 and PAL M-400 are extrusion grade Pseudo-boehmites. Extrudates obtained from PAL M-300 and PAL M-400 are characterized by controlled surface area, porosity and high mechanical robustness. Optimal recipe is normally tailored for specific customer requirements, but generic extrusion guidelines are available. BASF is uniquely positioned to combine market-leading catalysts manufactur-ing expertise with exceptional materials know-how to offer technical guidance and support application development per customer requirements.

We create chemistry

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About Us

BASF is a leading global manufacturer of catalysts for the chemical industry, with solutions across the chemical value chain. The business comprises chemical catalysts, adsorbents and custom catalysts. Priority is given to developing new and improved products that enable the chemical industry transformation to net-zero emissions.

BASF's chemical catalysts and adsorbents business is part of the company's Performance Chemicals division. The division's portfolio also includes refinery catalysts, fuel and lubricant solutions, as well as oilfield chemicals and mining solutions. Customers from a variety of industries including Chemicals, Plastics, Consumer Goods, Energy & Resources and Automotive & Transportation benefit from our innovative solutions.

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