ALMATIS
PREMIUM ALUMINA

PREMIUM ALUMINA FOR POLISHING APPLICATIONS

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Arkansas, USA

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Georgia, USA

Almatis, Inc.,
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Co. Ltd.,
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Almatis Limited,
Iwakuni,
Japan

Almatis – The Premium Alumina Company

With more than 100 years of alumina expertise, Almatis is the world's leader in the development, manufacture and supply of premium alumina and alumina-based products.

Almatis is both a global and fully integrated producer, serving our customers from sixteen strategically located sales, research and manufacturing sites. Our employees strive to exceed customers' expectations through industry leading customer service, technical support and manufacturing excellence. We implement leading technologies and continuous improvement programs, which have established Almatis products as the benchmark for quality and consistency. Our commitment to strong partnerships with our customers creates innovative solutions that support and enhance their growth in all regions of the world.

Almatis offers the most comprehensive alumina product portfolio in the industry. Our broad product line includes:

- Tabular aluminas
- Calcined and reactive aluminas
- Polishing aluminas
- Calcium aluminate cements
- Alphabond 300
- Dispersing aluminas
- Brown sintered alumina, BSA 96
- Alumina and magnesia-rich spinels
- Calcium hexa-aluminates, Bonite and SLA 92

Across our core markets—refractories, ceramics and polishing—we deliver one-stop shopping, always expanding our portfolio to meet customer and market requirements.

QUICK FACTS:

Global specialty alumina producer with over 100 years of expertise

Most comprehensive alumina portfolio

Closer to our customers with highest quality products

Reliable and secure supply from our refinery and 9 world-class production facilities

Excellent global and local service with leading-edge technical support

Continuous development of innovative solutions and applications know-how

Polishing: Cut and Shine

Alumina is one of the most important abrasive materials for polishing a wide range of surfaces. Considering the diverse customer needs for different applications, Almatis strives to find premium solutions to enable our customers to combine highest cutting rates and brilliant finishing results.

Almatis offers the broadest polishing portfolio in the industry and with this wide selection we offer the most efficient solution for each customer's specific need.

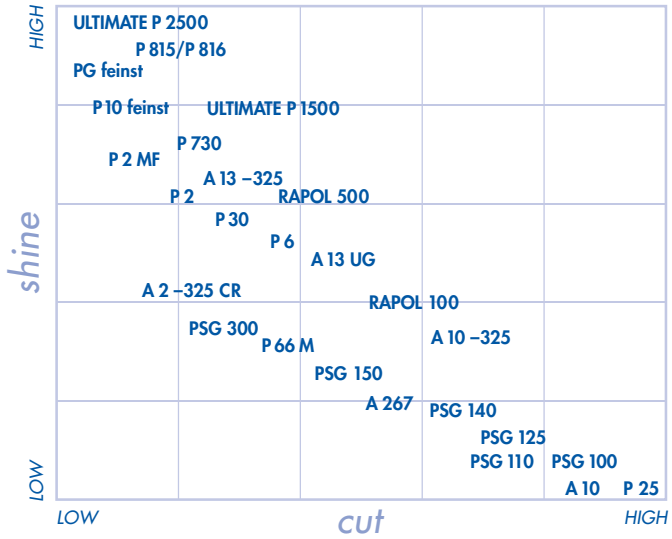
Tight specifications for surface area, as well as very narrow particle size distributions and well defined top cuts, ensure the consistency of Almatis polishing aluminas.

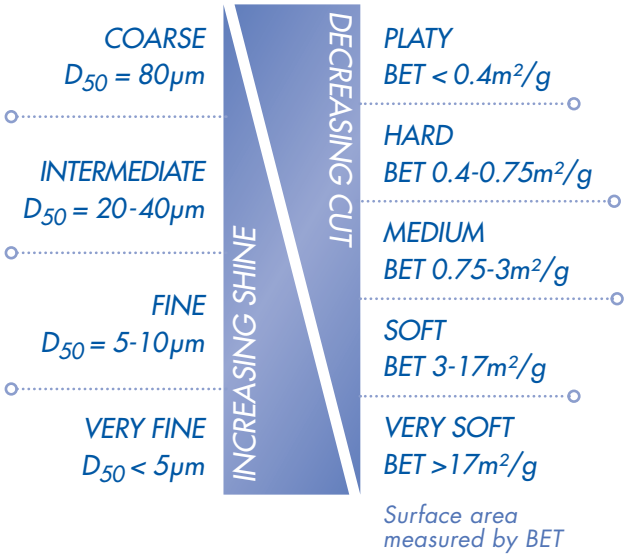
The degree of calcination, the size of both the agglomerates and the primary crystals, and the particle shape of the alumina directly influence the quality of the finished surface.

With large primary crystals and agglomerates, the cutting effect is greater. Conversely, with smaller primary crystals and agglomerates, the shine of the surface is higher.

At the beginning of the polishing process, the alumina agglomerates break down, giving a defined surface abrasion rate. As the primary crystals are released, a polishing action begins, defining the final surface quality.

Polishing Material Matrix





Degree of calcination

Thermal processing determines the primary crystal size:

- High temperatures lead to very large primary crystals (platy).
- Average temperatures create medium-sized primary particles (hard/medium burned).
- Low temperatures generate small primary particles (soft/very soft burned).

Particle size distribution

The degree of calcination is complemented with the right particle size distribution to fit the needs of the customer.

Almatis controls the overall particle size distribution and defines the top cut with some of the most advanced sizing equipment in the industry.

APPLICATIONS FOR THE DIFFERENT GRADES:

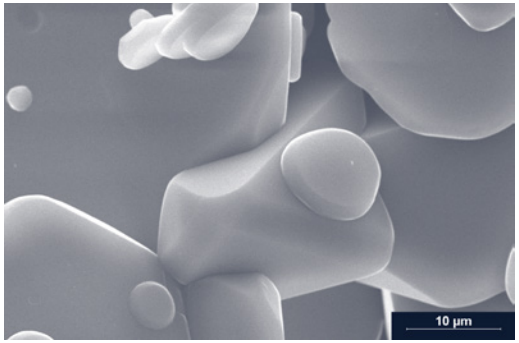
PLATY
mainly for lapping of silicon wafers

HARD
pre-polishing of metals and ceramic media for vibratory finishing

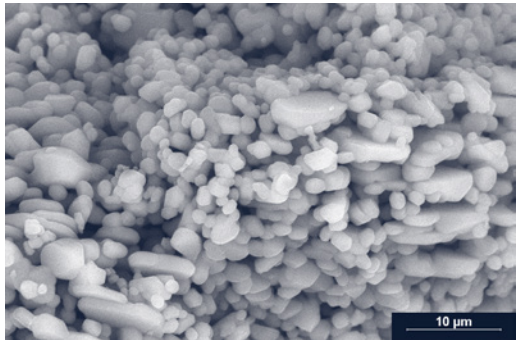
MEDIUM
brake pads and pre-polishing of metals

SOFT
finishing of all types of materials, brake pads, automobile polishing

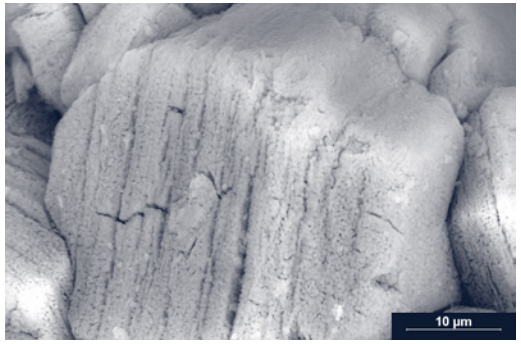
VERY SOFT
polishing of silver, cleaning of stones



PLATY



HARD



SOFT

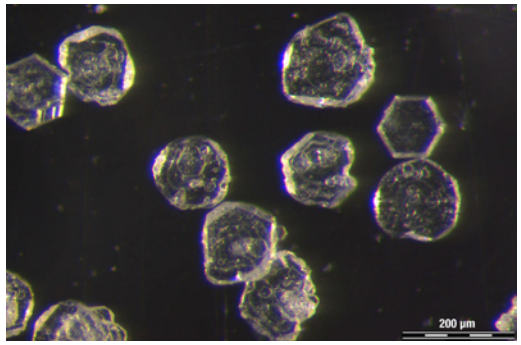
Alumina for Lapping

Platy alumina

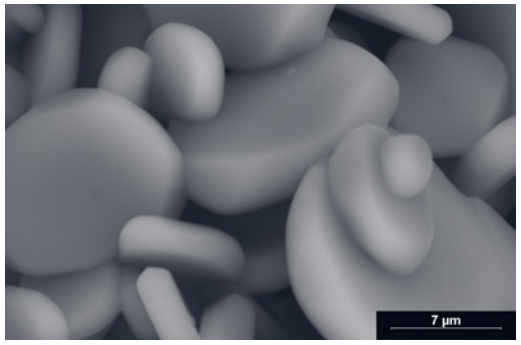
Almatis has the special capability to produce alumina crystals with a very unique particle size and shape. Products P 20 and P 25 have an average particle size of 20 and 25 micron, respectively, and a plate-like structure which remains stable during milling. Even the ground version, Gilox 63, still has a large primary crystal size. Of additional value, this family of platy, specialty aluminas are transparent. They are used for several diverse applications such as lapping of silicon wafers and wear resistant coatings.

Product	P 20	P 25	Gilox 63
Primary Crystal Size [µm]	16	22	15
Oil Absorption [%]	20-60	25-65	10-25

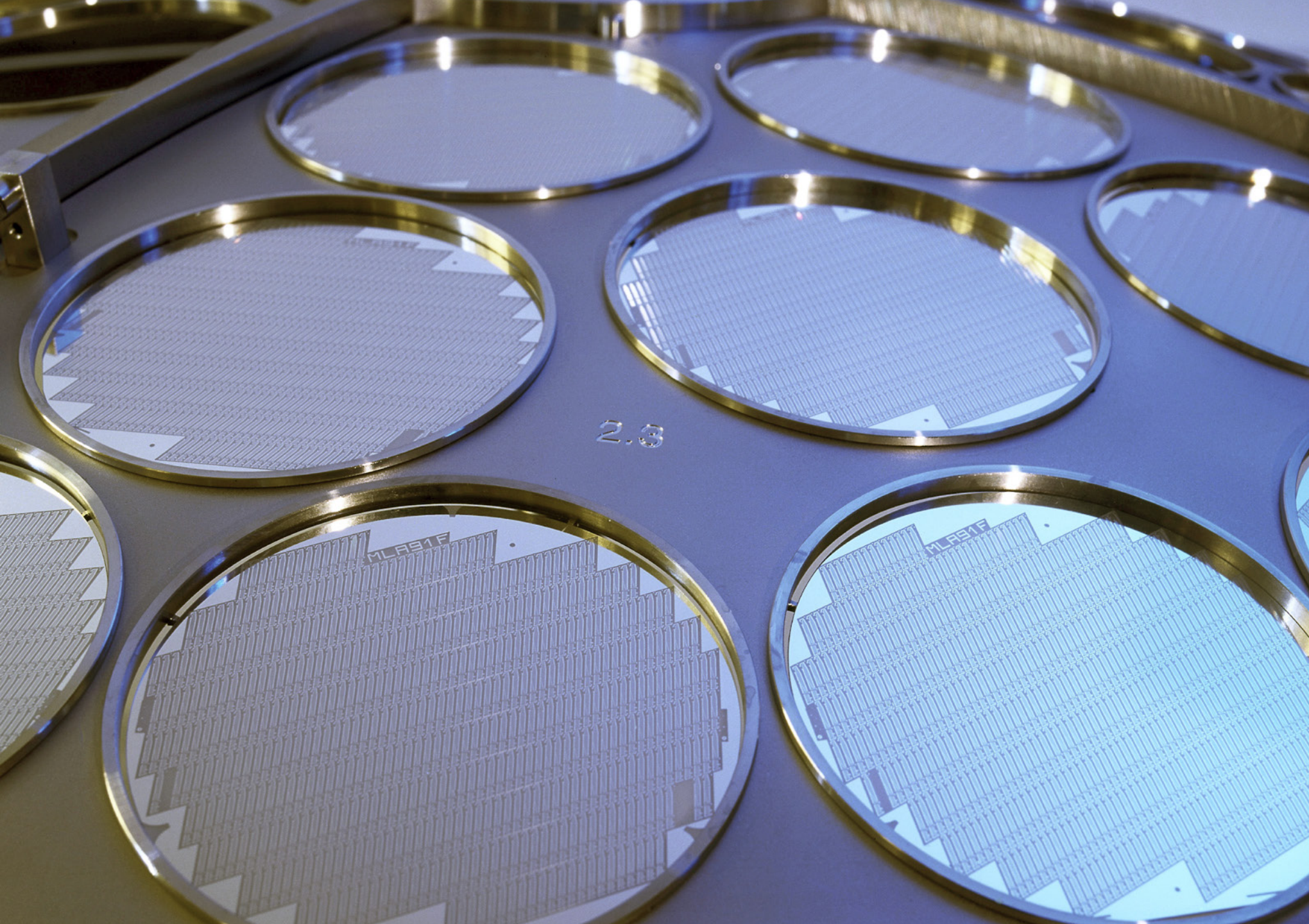
APPLICATION: Quartz crystal lapping



Transparency of P 25 crystals



SEM image of P 25 platy structure


2.3
MLA91F
MLA91F

Metal Polishing – Pre-Polishing

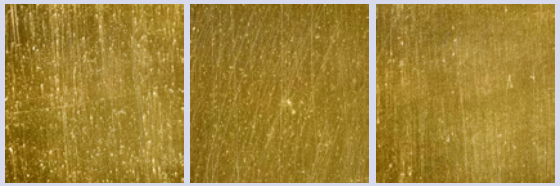
APPLICATION: Metal pre-polishing

Metal polishing is the largest polishing application for Almatis premium aluminas. To achieve high surface quality, a two-step approach is suggested. For the pre-polishing step, Almatis supplies a hard calcined PSG series with surface areas of 0.4-0.75m^2/g and clearly defined top cuts. Additionally, we offer other grades of unground, classified and continuous ground pre-polishing products.

The goal of pre-polishing operations is to achieve the highest possible abrasiveness together with a well-prepared surface. High performance pre-polishing compounds reduce the time and cost necessary for the final polishing steps by providing a surface with low roughness values.

Product	A 10	A 2 -325 CR	A 267	P 66 M	PSG 110	PSG 125	PSG 300	RAPOL 100
Top Cut	>150µm 1%	>45µm 0.5%	>45µm 25%	>125µm 1%	>150µm 0.2%	>125µm 2%	>40µm 0.2%	>150µm 1%
D50 [µm]	70	5	13	4.3	70	65	5	70
SSA [m^2/g]	0.3	0.8	0.6	0.9	0.5	0.50	0.70	3.5
Oil Absorption [%]	35	15	50	20	50	42	18	45

Metal Polishing – Finishing



RAPOL 500 P 2 P 2 MF

HIGHER CUT HIGHER GLOSS

Surface finish on brass substrates (magnification 15X)

For finishing of metal products, Almatis supplies a broad portfolio with unique performance in the 3-17m^2/g surface area range. Almatis will customize optimum cutting solutions, as well as polishing and brightening, for customer specific needs.

With state-of-the-art production technology and the support of our R&D department, we generate innovative solutions for our customers. By adjusting certain parameters we can manipulate the performance of products, such as P 2, in the direction of higher cut or higher gloss.

Product	RAPOL 500	P 2	P 2 MF	P 30	A 13 -325	P 730	P 10 feinst
Top Cut	>90µm 0.1%	>90µm 0.1%	>63µm 1%	>63µm 1%	>45µm 6%	>40µm 0.5%	>20µm 1%
D50 [µm]	15	11	15	10	4.5	4	3
SSA [m^2/g]	4	12	13	12	10	12	13
Oil Absorption [%]	35	40	43	36	30	35	33

Paint, Plastic and Resin Polishing

APPLICATION: Clear coat polishing

APPLICATION: Resin polishing

Paint and plastic polishing is one of the major applications for alumina. With Almatis premium alumina, our customers supply polishing compounds for furniture, automobile, marine and aerospace applications, to fulfill the challenging needs of these industries. Since these surfaces are comparably soft, the alumina quality is critical for the polishing process. Oversize particles will negatively impact the surface quality. Almatis has the capability to tightly control the hardness and top cut of these products to ensure high quality results.

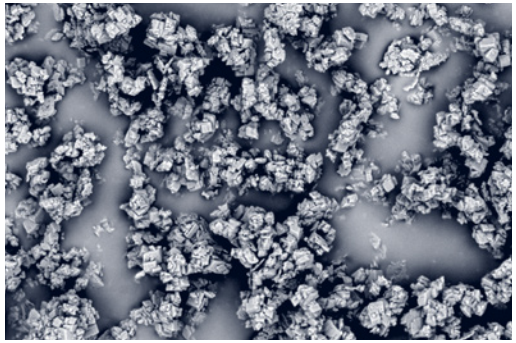
Almatis focuses on outperforming existing aluminas in the market and on supplying our customers with the highest quality solutions. We strive to develop alumina products with high cut and perfect finish, without any microcracks or haze.

For the highest performance, we recommend P 815/P 816 and our ULTIMATE series. For less sensitive applications, we offer products like P 2, RAPOL 500, P 730 and P 10 feinst.

Product	P 2	RAPOL 500	P 730	P 10 feinst
Top Cut	>90µm 0.1%	>90µm 0.1%	>40µm 0.5%	>20µm 1%
D50 [µm]	11	15	4	3
SSA [m^2/g]	12	4	12	13
Oil Absorption [%]	40	35	35	33

Paint, Plastic and Resin Polishing

APPLICATION: Marine gel coat polishing



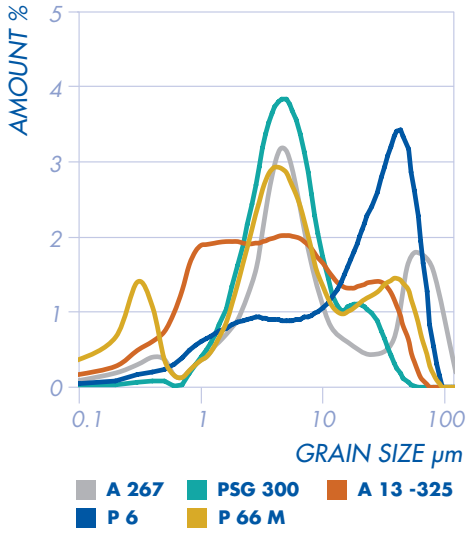
SEM image of ULTIMATE P 1500

In marine applications there are special requirements for the gel coat. Gel coats are very hard, modified resins that provide gloss and protect the fiberglass structure against ultraviolet degradation and hydrolysis. Polishing compounds need an aggressive cut, and in parallel, to achieve a smooth surface. Almatis offers specially designed aluminas for gel coat polishing, such as ULTIMATE P 1500, the best performing powder for that application.

Automobile paints are typically two-component systems, as these protect the vehicle better against UV light and abrasion. The alumina used in the polishing emulsion should provide high cut and perfect finish to the clear coat. Almatis P 815/P 816 is an economic and efficient product, giving good cut and polish. For high-end, scratch-free finishing, ULTIMATE P 2500 is the leading product in our portfolio.

Product	P 815/P 816	ULTIMATE P 1500	ULTIMATE P 2500
Top Cut	>45µm 0.5%	>45µm 0.5%	>20µm 0.5%
D50 [µm]	6	5	2.5
SSA [m^2/g]	8	5	8
Oil Absorption [%]	53	48	65

Brake Pads



Alumina is used in brake pads to clean contamination from the disc or drum coming from wear of other brake pad ingredients, especially carbon-based raw materials. Almatis premium aluminas are typically used as 2-10% of the pad formulation, depending upon whether it is a drum or a disc brake system.

The main function of the brake is converting kinetic energy into heat by friction. Disc brakes are generally considered superior to drum brakes, as they dissipate the heat more effectively and therefore perform better. With disc brakes greater braking forces can be achieved, but this results in higher temperatures being generated on the brake pads. Alumina has high heat resistance and its stability at high temperatures makes it an ideal brake pad component. Almatis' hard and medium crystalline grades are preferred for these systems.

APPLICATION: Brake pads

Drum brake

Soft burned grades such as P 02, P 6 and A 13 -325 are preferred.

Disc brake

Hard or medium crystalline grades such as P 66 M, PSG 300, A 267 or A 2 -325 CR are recommended.

Product	P 66 M	A 267	PSG 300	P 6	A 13 -325
Top Cut	>125µm 1%	>45µm 25%	>40µm 0.2%	>125µm 2%	>45µm 6%
D50 [µm]	4.3	13	5	33	4.5
Oil Absorption [%]	20	50	18	41	30

Alumina for Other Polishing

Stone polishing

After stone grinding, which is normally done with SiC or white fused alumina, the stone surface is pre-polished with a coarse, soft-burned alumina like A 13, P 6 or P 2. For the finishing step, fine ground, soft-burned aluminas like P 30, P 730 or A 13 -325 are best. For cleaning of the surface after polishing, PG feinst supports a gentle removal of any dirt.

Household cleaners

Many household cleaning products contain alumina for the removal of dirt, oxidation or other substances. Alumina offers high rates of material removal and remains inert over a wide pH range. Depending on the application, soft polishing materials like P 2, P 30, P 730 or P 10 feinst are ideal.

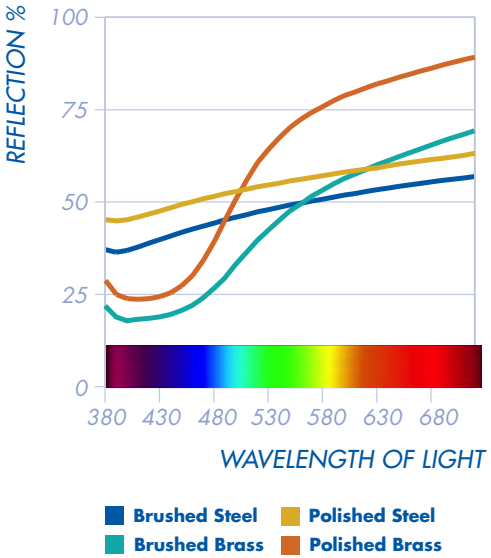
Cosmetics

Almatis premium alumina is used in cosmetic applications like toothpaste and facial cleansers. For these applications, soft and very fine materials are required to remove discoloration on teeth or act as an exfoliant for the skin.

APPLICATION: Stone polishing

APPLICATION: Cosmetics

Alumina Expertise Starts in our Research Labs



With experience accumulated over more than 100 years, Almatis has acquired in-depth knowledge about the relationship between crystal morphology, primary crystal size and shape, and the resulting polishing performance of the alumina. Our application engineers are able to create unique polishing products perfectly matching the needs of our customers. Almatis has multiple laboratories worldwide dedicated to product development. Technology advancements in cutting performance and the brightening effect of different polishing grades are continuously made.

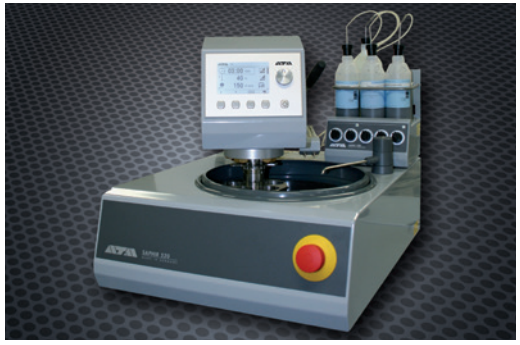
Cutting effect

Almatis researchers have developed a unique test method that can quantify alumina abrasiveness on any material.

Polishing effect

Almatis evaluates polished surfaces with advanced techniques to determine critical parameters such as roughness indicators and reflected light as a function of the wave length.

In cooperation with our customers, we engineer ever more precise test methods, enabling us to better understand the needs of our customers and to develop superior polishing grade aluminas to meet these needs. Almatis is committed to continually expanding our alumina expertise to meet our customers' challenges.



Polishing machine

Lab polished sample


IMAGE
ARCHIVE
SETTINGS
BRIGHTNESS
2500x
800µm

SELECTION OF POLISHING ALUMINAS FOR YOUR APPLICATION:

CALCINATION DEGREE	VERY SOFT		SOFT															
PRODUCT / APPLICATION	PG feinst	P 815/P 816	A 13 UG	A 13 -325	P 6	P 2	P 2 MF	P 730	P 10 feinst	RAPOL 100	RAPOL 500	ULTIMATE P 1500	ULTIMATE P 2500	PSG 110	A 2 -325 CR	A 267	P 66 M	PSG 100	PSG 125
Metal pre-polish			■		■					■				■	■	■	■	■	■
Metal polish		■		■		■	■	■	■		■		■						
Aluminum			■							■				■	■	■	■		■
Plastic/Paint/Resin	■	■				■		■	■		■	■	■						
Wood						■	■	■	■		■								
Glass	■	■		■				■	■										
Electronics									■										
Brake pads			■		■										■	■	■		
Stone	■		■	■	■	■	■	■	■	■	■				■		■		
Jewelry	■	■							■				■						
Cleaners	■		■	■	■	■	■	■	■	■	■								

*All data contained in this brochure represent typical properties obtained by Almatis test methods and are not intended to be taken as guaranteed values or specifications.

MEDIUM TO HIGH							
PSG 140	PSG 300	A 10	A 10 -325	P 20	P 25	Gilox 63	Gilox 125
■	■	■	■				
■	■	■	■				
				■	■	■	■
	■		■				
	■						

Almatis is committed to the global and secure supply of premium alumina products. Our focus on quality enables us to offer high-performance products with a long service life.

Our premium alumina products are made to global standardized specifications to facilitate supply from any plant to any region. Additionally, we offer tailor-made product solutions to specific market and customer needs.

Global quality and health and safety standards are rigorously applied in all our locations around the world. Almatis manufacturing facilities comply with EHS standards and ISO 9001, ISO 14001, and OHSAS 18001 to ensure high and consistent quality, while protecting the environment as well as our employees and contractors.

Almatis has a worldwide network of technical and sales specialists that understand application requirements and the latest market trends. Their in-depth knowledge allows the development of innovative new product solutions to enhance our customers' business. Six regional research and application laboratories work in close cooperation with our customers to optimize formulations and solve all application challenges.

For you, our customer, Almatis specialists are here to help.

For solutions to your alumina needs, contact us at ***polishing@almatis.com***

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Think alumina, think Almatis.