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PRODUCTS

Sillitin **Sillikolloid** 4

Standard products (natural, untreated fillers). Differ in brightness and particle size distribution.

puriss 14

Created by a downstream process. The extremely low residue > 40 µm is reduced even more and the dispersion properties are improved.

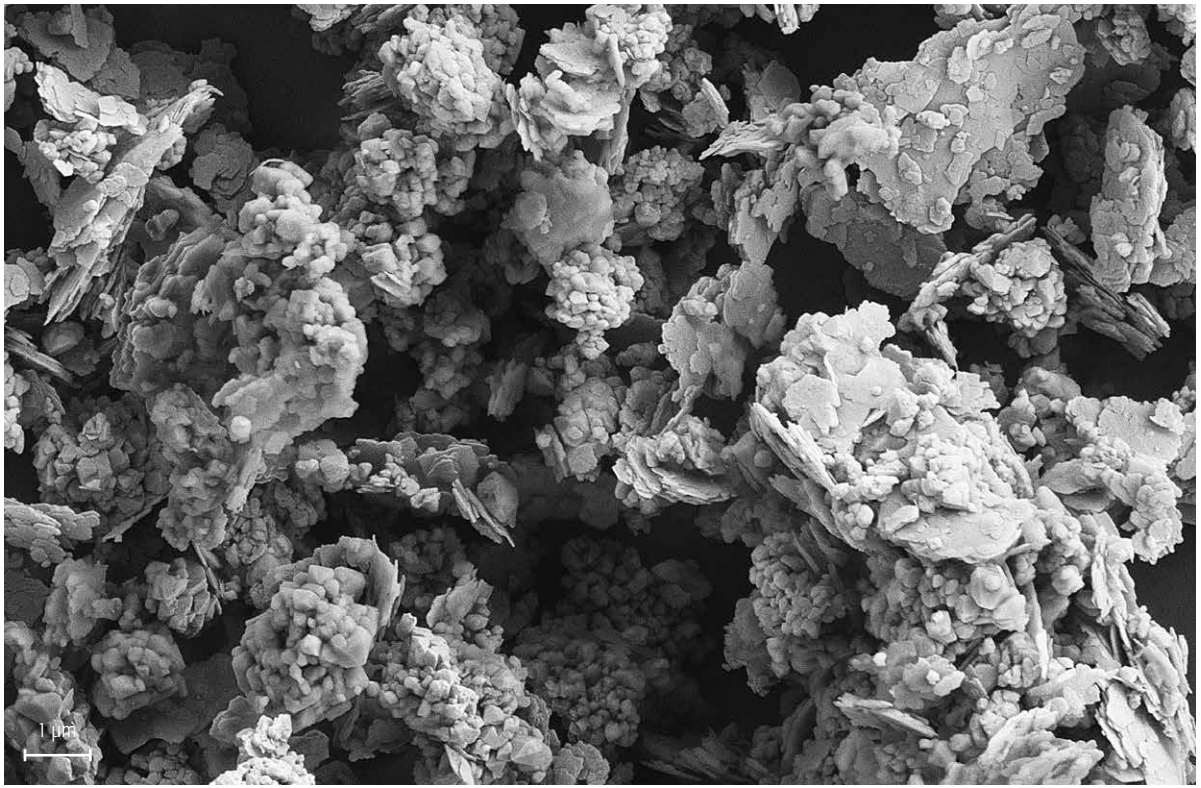
Silfit 18

Calcined products based on SILLITIN. A downstream thermal process gives the product additional application advantages as a functional filler.

aktifit 18

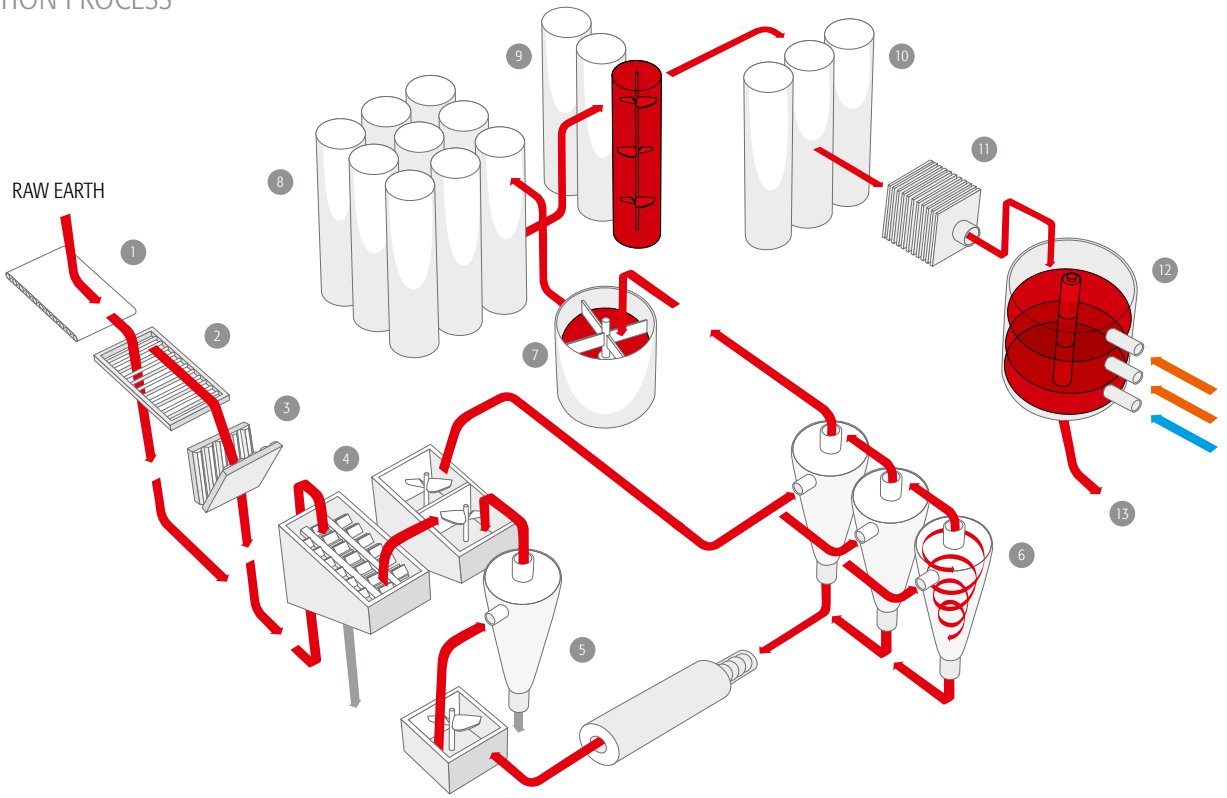
An activated SILFIT produced through surface treatment with special silanes.

Sillitin Sillikolloid – MORPHOLOGY



Classic Neuburg Siliceous Earth is a natural combination of corpuscular Neuburg Silica and lamellar kaolinite a loose mixture impossible to separate by physical methods. As a result of natural aging, the silica portion exhibits a round grain shape and consists of aggregated cryptocristalline primary particles of about 200 nm diameter. This unique structure leads to good application properties.

SEPARATION PROCESS



Basically speaking, our entire production process is a process of separation – only about 30 % of the raw earth extracted are a usable fine product. A particularly structure-conserving process separates the fine product from sand and sundry stones and rock. In the first step the raw material is dispersed in water and thus separated from gravel fractions. This is followed by the hydrocyclone unit which separates the sand fractions and sorts the fine particles into different particle sizes. The slurry obtained is then concentrated and the water removed in filter presses. Finally, the natural gas powered turbine dryers remove the remaining moisture. The slurry is then pulverized and stored for further processing.

1–3
Input and crushing of raw earth, separation of coarse material through vibration sieve

4–5
Separation of gravel fractions and dispersion in water

6
Separation of sand fractions and sorting into different grain sizes with a hydrocyclone unit

7–10
Concentration, storage and blending of different product types in the form of slurry

11–12
Removal of water in filter presses, extraction of remaining moisture in dryers

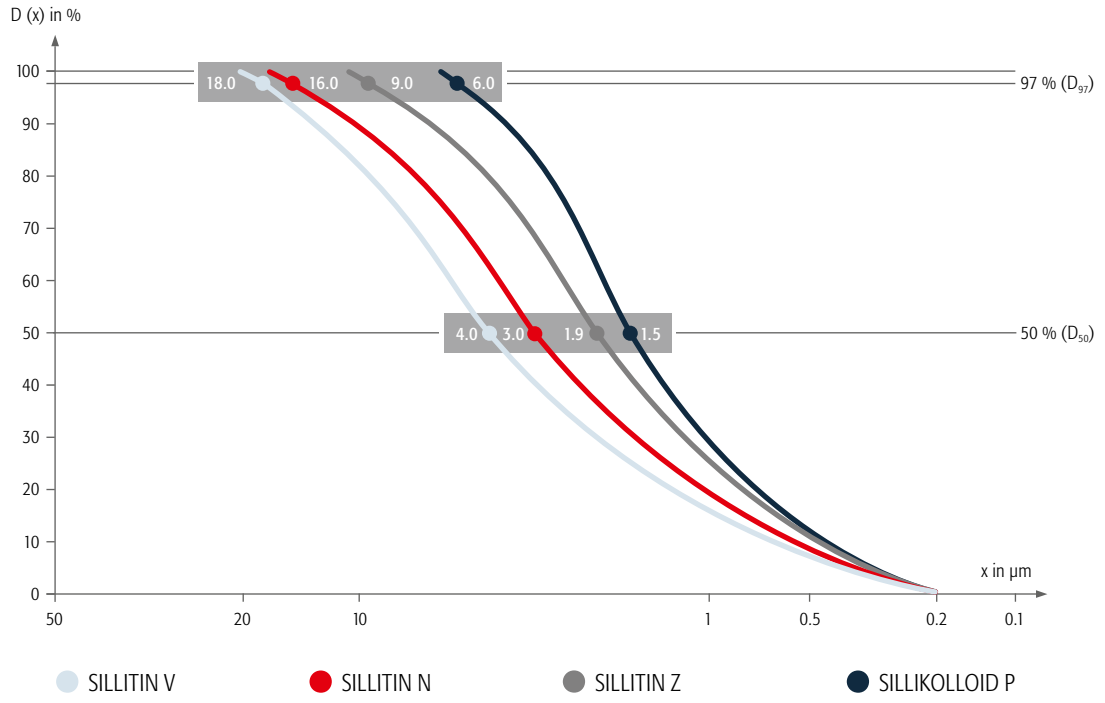
13
Refining, surface treatment, packaging

Sillitin Sillikolloid –
PARTICLE SIZE DISTRIBUTION

The particle size distribution, color value graphs and overview tables on the following pages show the physical properties and chemical composition of the Neuburg Siliceous Earth. The most significant differentiating characteristics are the particle size distribution and color neutrality.

Neuburg Siliceous Earth is available in four different particle fractions, identified by the letters V, N, Z and P.

PARTICLE SIZE DISTRIBUTION

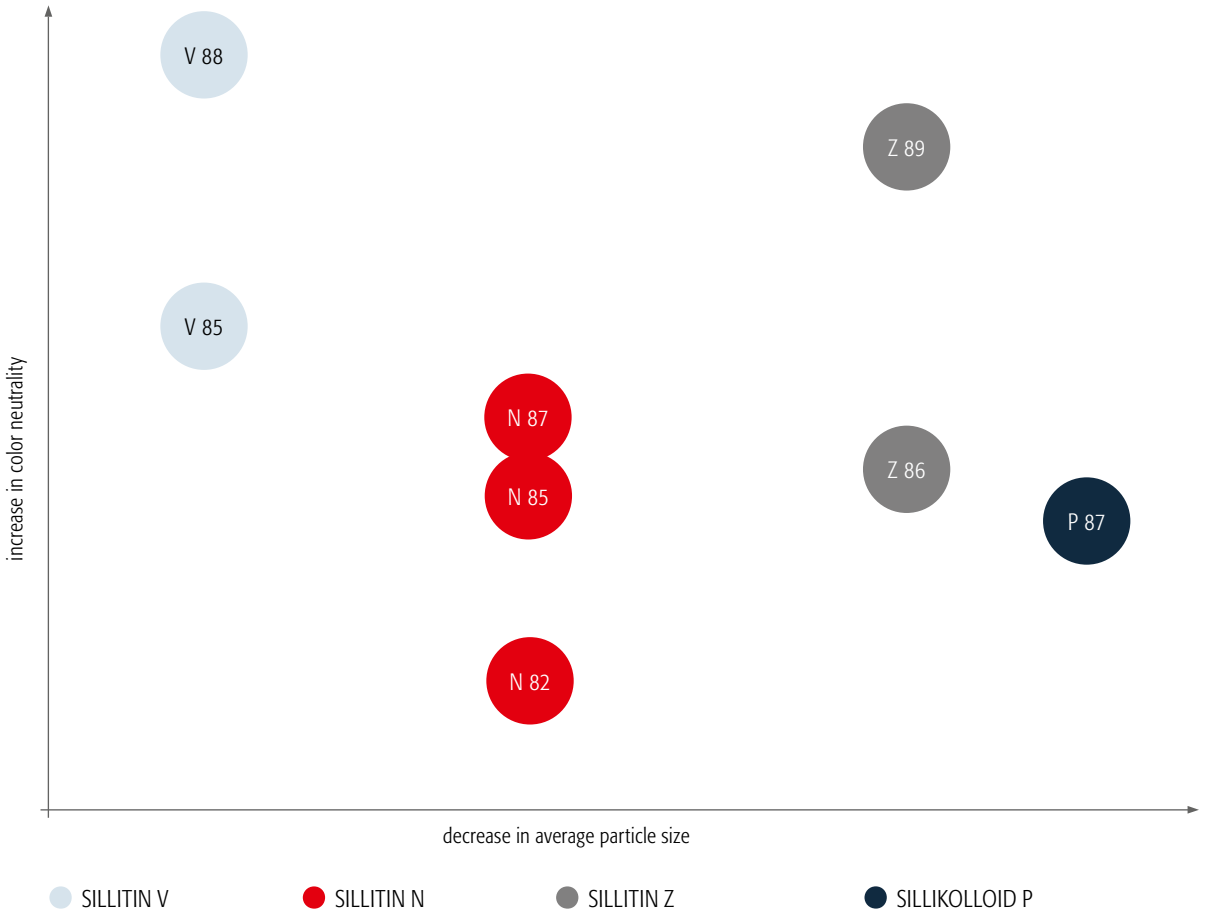


The measuring method for this particle size distribution is based on the Fraunhofer analysis of diffraction spectra. The analysis were performed with the Mastersizer 3000, a laser device from Malvern Instruments.

Sillitin Sillikolloid – COLOR NEUTRALITY

In addition, classic Neuburg Siliceous Earth is available in different shades and colors ranging from yellow to off-white to white depending on the particle size distribution. This color neutrality is expressed in numbers.

COLOR NEUTRALITY



Sillitin Sillikolloid – PRODUCT CHARACTERISTICS

PRODUCT CHARACTERISTIC	UNIT	SILLITIN V 85	SILLITIN V 88	SILLITIN N 82	SILLITIN N 85	SILLITIN N 87	SILLITIN Z 86	SILLITIN Z 89	SILLIKOLLOID P 87
Brightness Y		82	86	77	82	83	82	86	82
Brightness Z		76	88	65	75	76	75	86	76
Particle size D_{50}	µm	4.0	4.0	3.0	3.0	3.0	1.9	1.9	1.5
D_{97}	µm	18	18	16	16	16	9	9	6
Residue 40 µm	mg/kg	25	25	25	25	20	20	20	20
Volatile matter at 105 °C	%	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Electrical conductivity	µS/cm	80	80	80	80	80	80	80	80
pH value		8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5
Density	g/cm³	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6
Bulk density	g/cm³	0.35	0.35	0.30	0.30	0.30	0.25	0.25	0.25
Tamped density	g/cm³	0.60	0.60	0.50	0.50	0.50	0.40	0.40	0.40
Spec. surface area (BET)	m²/g	8	8	11	10	10	12	11	13
Oil absorption	g/100 g	45	45	45	45	45	55	55	55
Hardness silica/kaolinite		7/2.5	7/2.5	7/2.5	7/2.5	7/2.5	7/2.5	7/2.5	7/2.5
Abrasivity	mg	40	40	40	35	35	30	30	25
Refractive index n		1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55
Water solubility	%	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Acid solubility	%	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
CHEMICAL ANALYSIS:									
SiO_2	%	87	88	82	84	84	82	82	80
Al_2O_3	%	8	8	12	10	10	12	12	14
Fe_2O_3	%	< 1	< 1	< 1.5	< 1	< 1	< 1	< 1	< 1
MINERALOGICAL COMPOSITION:									
Neuburg Silica	%	70	70	60	65	65	60	60	55
Kaolinite	%	17	17	25	20	20	25	25	30
Amorphous mineral phases	%	8	8	10	10	10	10	10	10
Other minerals	%	5	5	5	5	5	5	5	5

The values shown in the table are to be considered as guidelines only.
Material specifications for each product are binding and are available on our website www.hoffmann-mineral.com.

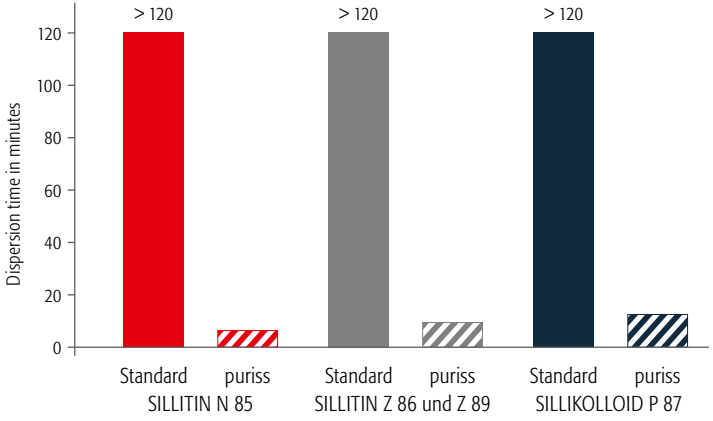
EINECS-Nr.: 310-127-6
CAS-Nr.: 1020665-14-8 (Siliceous Earth)
CAS-Nr.: 7631-86-9 (silica), 1318-74-7 (kaolinite)
TSCA-Nr.: 7631-86-9 (silica), 1318-74-7 (kaolinite)

puriss – PRODUCTS WITH IMPROVED DISPERSION PROPERTIES

- The extremely low residue of > 40 µm is significantly reduced even more.
- Reduction of abrasivity and wear. Protection of user's processing equipment.
- The puriss-products are the No. 1 choice for extremely high requirements for incorporation and dispersion performance.
- Outstanding gentle cleaning and polishing effect. Especially suitable for particularly sensitive surfaces. No unwanted scratching and the polished surface reaches a high gloss finish.

DISPERSION PROPERTIES IN ESTER PLASTICIZER

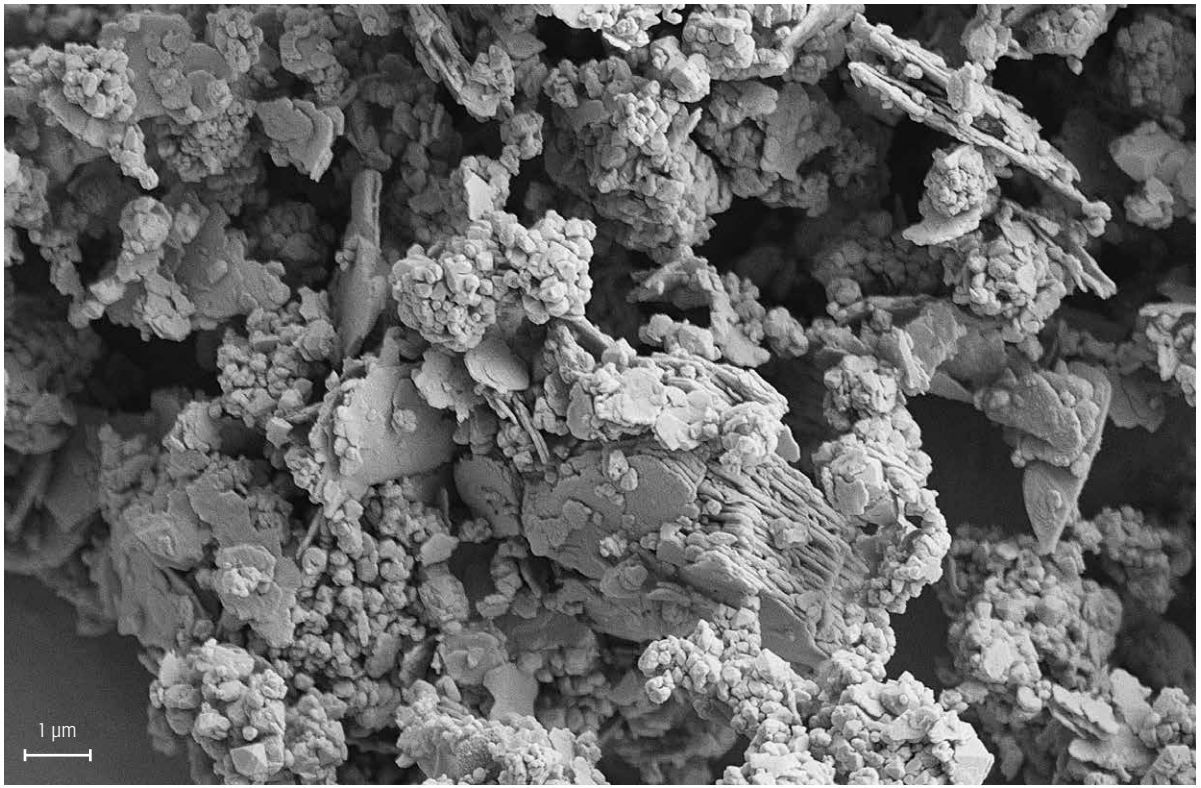
Stirred with blade mixer 1200 rpm, 20 % filler concentration, grain size (Hegman gauge) ≦ 20 µm



PRODUCT CHARACTERISTIC	UNIT	SILLITIN N85 puriss	SILLITIN Z86 puriss	SILLITIN Z89 puriss	SILLIKOLLOID P 87 puriss
Brightness Y Brightness Z		82 75	82 75	86 86	82 76
Particle size D_{50} D_{97}	µm µm	3.0 16	1.9 9	1.9 9	1.5 6
Residue 40 µm	mg/kg	8	8	8	8
Volatile matter at 105 °C	%	0.5	0.5	0.5	0.5
Electrical conductivity	µS/cm	80	80	80	80
pH value		8.5	8.5	8.5	8.5
Density Bulk density Tamped density	g/cm³ g/cm³ g/cm³	2.6 0.28 0.48	2.6 0.23 0.37	2.6 0.20 0.34	2.6 0.20 0.34
Oil absorption	g/100 g	45	55	55	55
Hardness silica/ kaolinite Abrasivity	 mg	7/2.5 35	7/2.5 30	7/2.5 30	7/2.5 20
Refractive index n		1.55	1.55	1.55	1.55
Water solubility Acid solubility	% %	< 0.5 < 1	< 0.5 < 1	< 0.5 < 1	< 0.5 < 1
Dispersion time in ester plasticizer	min	3	7	7	8
CHEMICAL ANALYSIS: SiO_2 Al_2O_3 Fe_2O_3	 % % %	 84 10 < 1	 82 12 < 1	 82 12 < 1	 80 14 < 1
MINERALOGICAL COMPOSITION: Neuburg Silica Kaolinite Amorphous mineral phases Other minerals	 % % % %	 65 20 10 5	 60 25 10 5	 60 25 10 5	 55 30 10 5

The values shown in the table are to be considered as guidelines only. Material specifications for each product are binding and are available on our website www.hoffmann-mineral.com.

Silfit aktifit – MORPHOLOGY



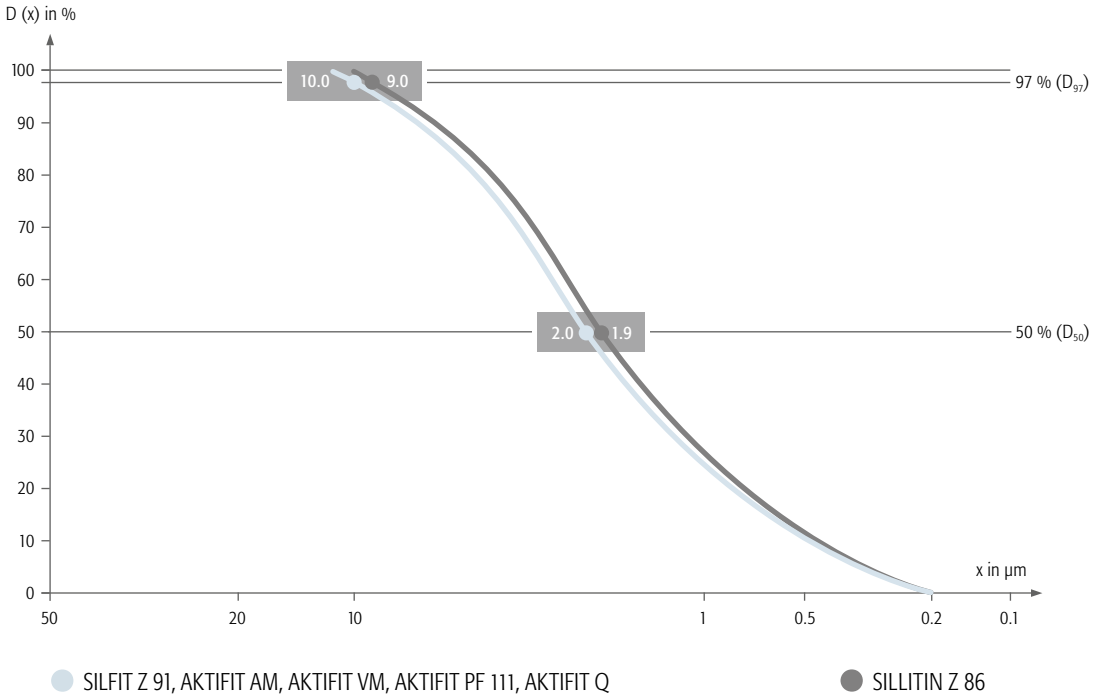
Our calcined products SILFIT and AKTIFIT are based on the standard product SILLITIN Z 86. A thermal process is used to expel the crystalline water in the kaolinite portion and new mineral phases are formed practically amorphous. The silica portion remains inert at the temperature used. The resulting products have an outstandingly high degree of white and color neutrality.

Silfit aktifit – COMPARISON OF PARTICLE SIZE DISTRIBUTION

THERE ARE FIVE CALCINED NEUBURG SILICEOUS EARTH PRODUCTS AVAILABLE:

- Basic product SILFIT Z 91
- Four surface-treated products:
  - AKTIFIT AM treated with amino silane
  - AKTIFIT PF 111 treated with alkyl silane
  - AKTIFIT Q treated with methacrylic silane
  - AKTIFIT VM treated with vinyl silane

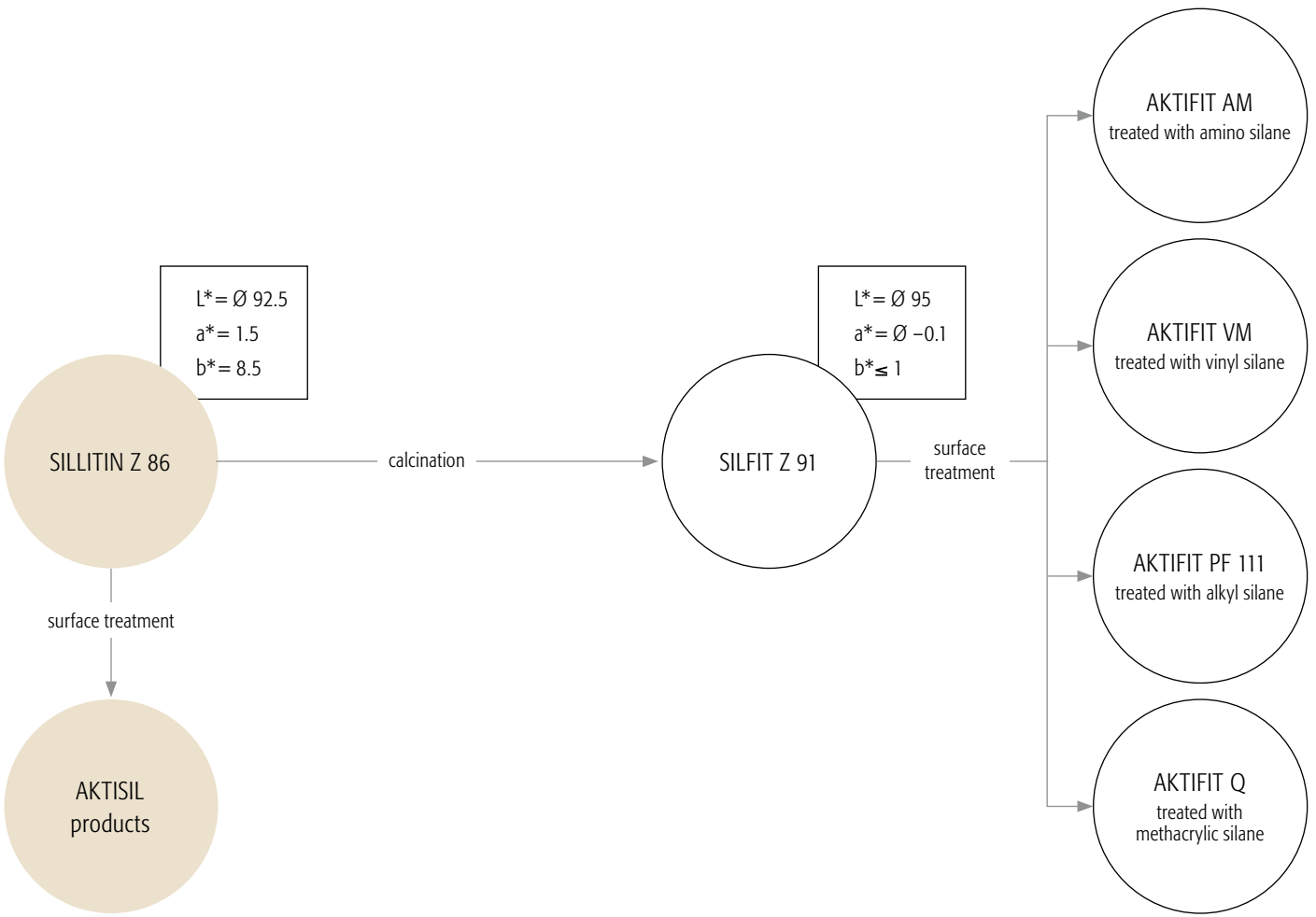
All calcined products have a particle size close to that of the uncalcined basic material SILLITIN Z 86.



The measuring method for this particle size distribution is based on the Fraunhofer analysis of diffraction spectra. The analyses were performed with the Mastersizer 3000, a laser device from Malvern Instruments.

Silfit aktifit – CIELAB COLOR VALUES

With regard to the CIELAB Color Values L*, a* and in particular b*, the calcined products are significantly brighter and more color neutral than the basic material.



Silfit aktifit – PRODUCT CHARACTERISTICS

PRODUCT CHARACTERISTIC	UNIT	SILFIT Z 91	AKTIFIT AM	AKTIFIT PF 111	AKTIFIT Q	AKTIFIT VM
Basic material		SILLITIN Z 86	SILFIT Z 91	SILFIT Z 91	SILFIT Z 91	SILFIT Z 91
Silanized with		untreated	Amino silane	Alkyl silane	Methacrylic silane	Vinyl silane
Color values L*		95	95	94	94	94
a*		– 0.1	– 0.1	– 0.2	– 0.1	– 0.1
b*		1	1	1	1	1
Particle size D_{50}	µm	2.0	2.0	2.0	2.0	2.0
D_{97}	µm	10	10	10	10	10
Residue > 40 µm	mg/kg	10	10	10	20	10
Volatile matter at 105 °C	%	0.2	0.2	0.2	0.2	0.1
Density	g/cm³	2.6	2.6	2.6	2.6	2.6
Bulk density	g/cm³	0.33	0.31	0.30	0.32	0.37
Tamped density	g/cm³	0.55	0.55	0.60	0.65	0.67
Spec. surface area (BET)	m²/g	10	9	9	9	9
Oil absorption	g/100 g	65	65	60	65	65
Silica hardness/calcined kaolinite		7/4.5	7/4.5	7/4.5	7/4.5	7/4.5
Refractive index n		1.55	1.55	1.55	1.55	1.55
Water solubility	%	< 0.5	< 0.5	not applicable	not applicable	not applicable
Acid solubility	%	< 1	< 1	not applicable	not applicable	not applicable
pH value		6.5	9	not applicable	not applicable	not applicable
Water absorption	ml/g	not specified	not specified	≤ 0.1	≤ 0.01	≤ 0.1
CHEMICAL ANALYSIS: SiO_2	%	86	86	86	86	86
Al_2O_3	%	13	13	13	13	13
Fe_2O_3	%	< 1	< 1	< 1	< 1	< 1
MINERALOGICAL COMPOSITION:						
Neuburg Silica	%	60	60	60	60	60
Calcined kaolinite	%	40	40	40	40	40
Equilibrium moisture content at 25 °C						
and 50% relative humidity	%	0.12	0.11	0.07	0.04	0.05
and 80% relative humidity	%	0.22	0.29	0.10	0.06	0.07
and 90% relative humidity	%	0.54	0.55	0.13	0.07	0.08
Reactive			✓		✓	✓
Hydrophobic				✓	✓	✓

The values shown in the table are to be considered as guidelines only. Material specifications for each product are binding and are available on our website www.hoffmann-mineral.com.

EINECS-Nr.: 310-127-6
CAS-Nr.: 1214268-39-9 (Siliceous Earth, calcined)
CAS-Nr.: 7631-86-9 (silica), 92704-41-1 (kaolin, calcined)
TSCA-Nr.: 7631-86-9 (silica), 92704-41-1 (kaolin, calcined)

ADVANTAGES OF NEUBURG SILICEOUS EARTH AND CALCINED NEUBURG SILICEOUS EARTH IN POLISHING AND CLEANING AGENTS

FILLER PROPERTY	ADVANTAGES IN POLISHING AND CLEANING AGENTS
loose structure, close and uniform particle size distribution	easy incorporation into water and O/W-emulsions, excellent dispersion properties (especially puriss products), quick and easy production, very low sedimentation speed, easily re-dispersible
mineralogical composition (hardness)	stable and constant polishing efficiency
extremely low residue of > 40 µm in puriss-products	no unwanted scratching, high gloss finish
available in different particle sizes	adjustable abrasivity
synergetic effect with aluminum oxide	for badly contaminated but sensitive surfaces, very high gloss finish, expensive aluminum oxide can be reduced
good rheological properties	thixotropic agent, control of rheology possible, reduction of expensive additives
very low electrical conductivity, no buffer effect	good stability in aqueous formulas, no disturbing salts/electrolytes
superior chemical resistance	high resistance to aggressive media such as acids and bases
high purity	also suitable for food contact incl. drinking water as per FDA and BfR regulations

SPECIAL ADVANTAGES OF CALCINED NEUBURG SILICEOUS EARTH IN POLISHING AND CLEANING AGENTS

FILLER PROPERTY	ADVANTAGES IN POLISHING AND CLEANING AGENTS
very high brightness and color neutrality	for white products without yellowness, less need for pigments
excellent dispersion properties	quick and easy production
particle size < 10 µm	no scratching, high gloss finish with increased cut

POLISHING AND CLEANING AGENTS

CAR CARE

ADVANTAGES:

- excellent dispersion properties
- good cut
- gentle cleaning
- high gloss finish
- no scratching

RECOMMENDED PRODUCTS:

- SILLITIN V 85
  standard product, highest cut
- SILLITIN V 88
  as V 85, but with higher color neutrality
- SILLITIN N 85
  finer than V 85, balanced profile of properties in terms of cut and gloss
- SILLITIN N 85 puriss
  as N 85, but with less residue
- SILLITIN Z 86
  finer than N 85, higher gloss
- SILLITIN Z 86 puriss
  as Z 86, but with less residue and improved dispersion
- SILLITIN Z 89
  as Z 86, but with higher color neutrality
- SILLITIN Z 89 puriss
  as Z 89, but with less residue and improved dispersion
- SILLIKOLLOID P 87
  for particularly sensitive surfaces, finest product, highest gloss
- SILLIKOLLOID P 87 puriss
  as P 87, but with less residue and improved dispersion
- SILFIT Z 91
  highest brightness and color neutrality, low residue, higher cut
- AKTIFIT PF 111
  as Aktisil PF 777, but highest brightness and color neutrality as well as improved dispersion

HOUSEHOLD CLEANER

E. G. GLASS, GLASS-CERAMIC, METAL, NATURAL STONE, PEDESTAL, PLASTIC, PORCELAIN, STAINLESS STEEL

ADVANTAGES:

- excellent dispersion properties
- very low sedimentation
- good cut
- gentle cleaning
- no scratching
- acid-resistant
- also suitable for food contact and drinking water applications (as per FDA and BfR regulations)

RECOMMENDED PRODUCTS:

- SILLITIN Z 86
  standard product, specially suitable for glass-ceramic cooktop cleaners
- SILLITIN Z 86 puriss
  as Z 86, but with less residue and improved dispersion
- SILLITIN Z 89
  as Z 86, but with higher color neutrality
- SILLITIN Z 89 puriss
  as Z 89, but with less residue and improved dispersion
- SILLITIN V 85
  highest cut
- SILLITIN N 85
  balanced profile of properties in terms of cut and gloss
- SILLIKOLLOID P 87
  finest product, very gentle cleaning, lowest sedimentation
- SILLIKOLLOID P 87 puriss
  as P 87, but with less residue and improved dispersion
- SILFIT Z 91
  highest brightness and color neutrality, low residue, higher cut
- AKTIFIT PF 111
  as Aktisil PF 777, but highest brightness and color neutrality as well as improved dispersion

POLISHING AND CLEANING AGENTS

METAL POLISH

ADVANTAGES:

- excellent dispersion properties
- good cut
- gentle cleaning
- high gloss finish
- no scratching

RECOMMENDED PRODUCTS:

- SILLITIN N 85
  balanced profile of properties in terms of abrasivity and gloss, specially suitable for chrome and aluminum
- SILLITIN N 85 puriss
  as N 85, but with less residue
- SILLITIN V 85
  coarser than N 85, highest cut
- SILLITIN Z 86
  finer than N 85, higher gloss
- SILLITIN Z 86 puriss
  as Z 86, but with less residue and improved dispersion
- SILLITIN Z 89
  as Z 86, but with highest brightness and color neutrality
- SILLITIN Z 89 puriss
  as Z 89, but with less residue and improved dispersion
- SILLIKOLLOID P 87
  finest product, highest gloss, specially suitable for noble metal like silver and gold
- SILLIKOLLOID P 87 puriss
  as P 87, but with less residue and improved dispersion
- SILFIT Z 91
  highest brightness and color neutrality, low residue, higher cut

INDUSTRY POLISH

E. G. CERAMIC, COATINGS, GLASS, LEATHER, NATURAL STONE, PLASTIC

ADVANTAGES:

- excellent dispersion properties
- very low sedimentation
- good cut
- gentle cleaning
- no scratching
- acid-resistant

RECOMMENDED PRODUCTS:

- SILLITIN Z 86
  standard product
- SILLITIN Z 86 puriss
  as Z 86, but with less residue and improved dispersion
- SILLITIN Z 89
  as Z 86, but with highest brightness and color neutrality
- SILLITIN Z 89 puriss
  as Z 89, but with less residue and improved dispersion
- SILLITIN V 85
  highest cut
- SILLITIN N 85
  balanced profile of properties in terms of cut and gloss
- SILLIKOLLOID P 87
  finest product, low cut, lowest sedimentation
- SILLIKOLLOID P 87 puriss
  as P 87, but with less residue and improved dispersion
- SILFIT Z 91
  highest brightness and color neutrality, low residue, higher cut
- AKTIFIT PF 111
  as Aktisil PF 777, but highest brightness and color neutrality as well as improved dispersion

INDUSTRY

WELDING ELECTRODES

FLUX-CORED ELECTRODES, ROD ELECTRODES, RUTILE ELECTRODES

ADVANTAGES:

- ideal chemical composition through natural combination of silica and kaolinite
- no unwanted side effects with the binder, such as sodium silicate (water glass)
- improved workability
- very good extrusion properties
- high specific surface area and pore structure
- very good slag flow through uniform shearing
- welding possible in all positions

RECOMMENDED PRODUCTS:

- SILLITIN N 85
  standard product, balanced profile of properties
- SILLITIN Z 86
  as Sillitin N 85, but higher Al_2O_3 content
- SILLITIN V 85
  as Sillitin N 85, but reduced Al_2O_3 content
- SILFIT Z 91
  excellent slag flow, highest color neutrality, lowest moisture content

INORGANIC CONSTRUCTION CHEMICALS

ADVANTAGES:

- adjustable rheology through selection of product (additives can be reduced)
- high chemical and acid resistance
- good mechanical properties (high strength)
- high color neutrality
- also suitable for food contact and drinking water applications (as per FDA and BfR regulations)

RECOMMENDED PRODUCTS:

- SILLITIN Z 86
  standard product, balanced profile of properties
- SILFIT Z 91
  highest brightness and color neutrality
- AKTIFIT PF 111
  as Z 91, but with higher rheological activity (strongly shear thinning), improved water resistance

INDUSTRY

PAPER COATINGS

ADVANTAGES:

- easy and rapid incorporation
- excellent dispersion properties
- color neutrality
- reduction of pigment content
- good pigment dispersion (spacer effect)
- scratch resistant, abrasion resistant
- also suitable for food contact

RECOMMENDED PRODUCTS:

- SILFIT Z 91
  highest brightness and color neutrality
- SILLITIN Z 89
  high brightness and color neutrality, high gloss
- SILLITIN V 88
  best matting

FRICTION LININGS

ADVANTAGES:

- high friction coefficient
- stable friction behavior
- very good mechanical properties
- suitable for heavy duty applications
- no static charging of the aramid fiber pulp

RECOMMENDED PRODUCTS:

- SILLITIN V 85
  standard product
- SILFIT Z 91
  high color neutrality

CARRIERS FOR ACTIVE SUBSTANCES

PLANT PROTECTION AND CARRIERS FOR ACTIVE SUBSTANCES

ADVANTAGES:

- excellent mixing and dispersion properties
- very low sedimentation
- easily re-dispersible
- good wettability
- good substance stability
- grinding aid
- high purity

RECOMMENDED PRODUCTS:

- SILLITIN Z 86
  standard product, balanced profile of properties
- SILLIKOLLOID P 87
  lowest sedimentation, finer particle size distribution
- SILLITIN N 85
  coarser particle size distribution

COSMETICS AND BODY CARE

PEELING CREAM

ADVANTAGES:

- gentle cleansing
- removes dead skin particles and impurities quickly and gently
- pore opening
- natural product (natural mineral combination)
- high purity

RECOMMENDED PRODUCTS:

- SILLITIN Z 86
  standard product with fine particle size distribution
- SILLITIN Z 89
  as Z 86, but with higher brightness and color neutrality
- SILLITIN V 85
  highest cleansing effect
- SILLITIN N 85
  as Z 86, but with coarser particle distribution

TOOTHPASTE AND DENTAL CARE TABLETS

ADVANTAGES:

- gentle cleaning and polishing effect
- natural product (natural mineral combination)
- high purity

RECOMMENDED PRODUCTS:

- SILLITIN N 82
  standard product, yellowish
- SILLITIN N 85
  as N 82, but with higher brightness and color neutrality
- SILLITIN Z 86
  as N 85, but with finer particle distribution
- SILLITIN Z 89
  as Z 86, but with higher color neutrality
- SILFIT Z 91
  white and highest color neutrality, use of pigments can be reduced

Sillitin Sillikolloid Silfit aktifit

PRODUCT CHARACTERISTIC	TESTING METHOD
Brightness Y Brightness Z	acc. to DIN 53 163/measuring geometry d/8°
Color values L* a* b*	acc. to CIELAB
Particle size D_{50} D_{97}	acc. to ISO 13320
Residue 40 µm	acc. to DIN EN ISO 787 part 18
Volatile matter at 105 °C	acc. to DIN EN ISO 787 part 2
Density Bulk density Tamped density	acc. to DIN EN ISO 787 part 10 acc. to DIN ISO 903-1976 acc. to DIN EN ISO 787 part 11
Spec. surface area (BET) Oil absorption	acc. to DIN ISO 9277 acc. to DIN EN ISO 787 part 5
Water absorption	acc. to Baumann
Hardness silica/kaolinite Abrasivity	acc. to Mohs acc. to Einlehner
Refractive index n	sin α/sin β
Water solubility Acid solubility	acc. to DIN EN ISO 787 part 3 acc. to DIN 53 770 (0.1 N HCl)
pH value	acc. to DIN EN ISO 787 part 9
CHEMICAL ANALYSIS: SiO_2 Al_2O_3 Fe_2O_3	acc. to DIN 51001 (RFA)
MINERALOGICAL COMPOSITION: Corpuscular silica Amorphous mineral phases Kaolinite and other minerals	based on X-ray diffraction pattern analysis combined with Rietveld
Equilibrium moisture content at 25 °C and 50 % relative humidity and 80 % relative humidity and 90 % relative humidity	following DIN 66138
Dispersion time in ester plasticizer	UGR-PV/PT/67