Neuburg Siliceous Earth
Floor Coating based on 2K Polyaspartic

Author: Petra Zehnder

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Status Quo

- Various reactive resin systems are used for durable and resilient floor coatings.
- Environmental and health aspects are becoming increasingly important.
- Modern, low-monomer raw materials can be used to formulate solvent-free coatings with improved workplace hygiene and environmental compatibility.
- Polyaspartic systems offer an additional advantage over other systems in terms of productivity and labor costs thanks to their fast drying time.
- Suitable fillers can help to optimize the formulation and thus improve performance and durability.

Formulations

Component A		parts by weight	
Desmophen NH 1423 LF	Binding agent: aspartic acid ester	16.50	
Sylosiv A4	Desiccant	1.09	
Byk-327	Leveling agent	0.34	
Disperbyk 2205	Wetting/dispersing agent	0.17	
Kronos 2360	White pigment, titanium dioxide	3.44	
Natural barium sulfate	Filler *replaced by volume*	25.16	---
Neuburg Siliceous Earth	Filler	---	14.87
Desmophen NH 1423 LF	Binding agent: aspartic acid ester	8.21	
Desmophen NH 1723 LF	Reaktive diluent: aspartic acid ester	10.59	
CSTIColor White 6	Pigment paste	3.35	
Total		**68.85**	**58.56**
Component B			
Desmodur ultra N 31100	Aliphatic polyisocyanate based on HDI	31.15	
Total A + B		**100.00**	**89.71**
Crosslinking ratio NCO/NH	110 %		

Mixing i

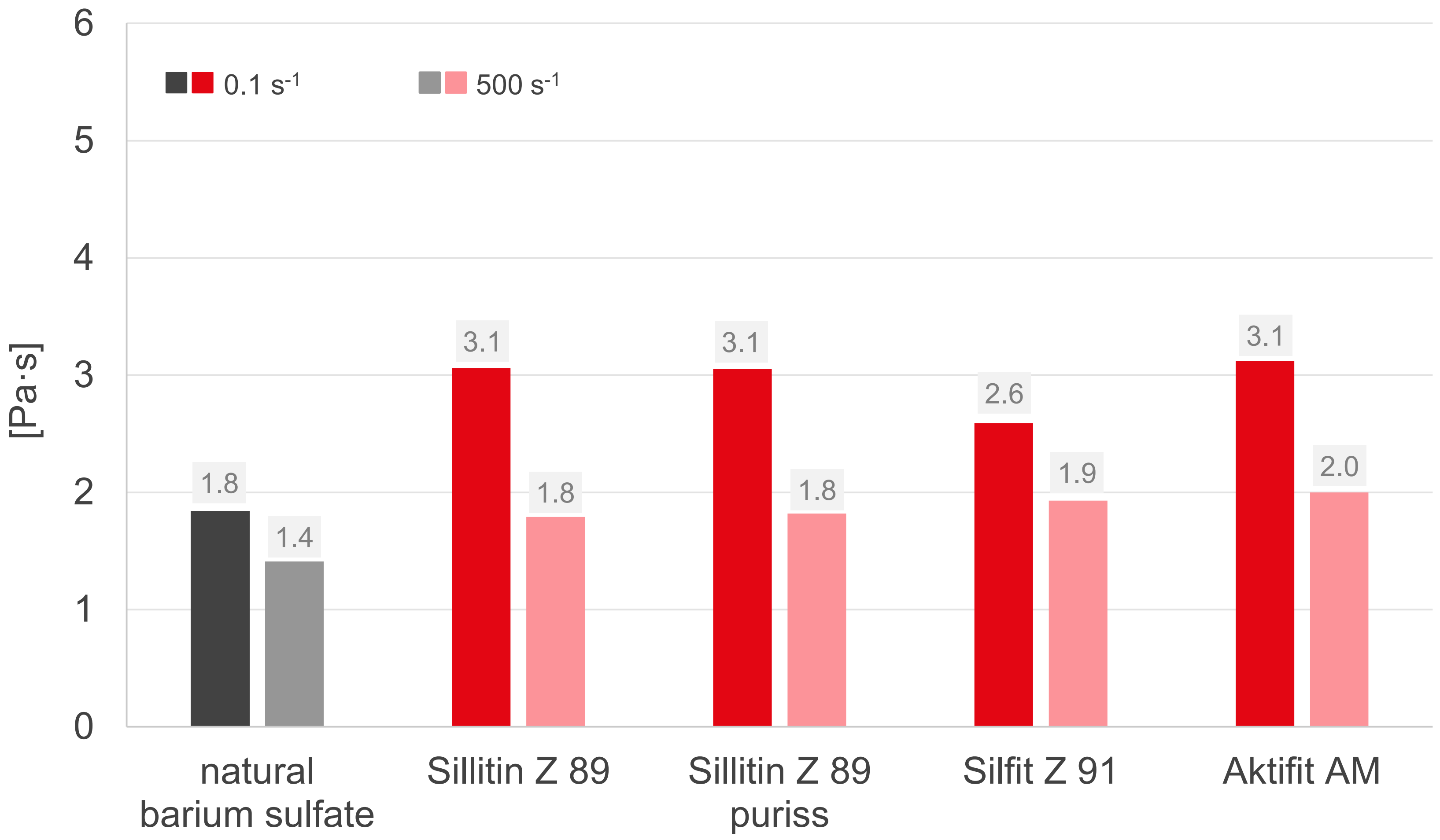
Filler characteristics

	Particle size		Color CIELab			Oil absorption	Density	Specific surface area BET	Special characteristics - Surface treatment
	d_{50} [µm]	d_{97} [µm]	L* [-]	a* [-]	b* [-]	[g/100g]	[g/cm³]	[m²/g]	
Natural barium sulfate	3.9	16	95.5	-0.1	0.2	13	4.4	1,7	-
Sillitin Z 89	1.9	9	96.1	0.2	4.2	55	2.6	11	-
Sillitin Z 89 puriss	1.9	9	96.1	0.2	4.2	55	2.6	11	improved dispersion properties
Silfit Z 91	2.0	10	96.5	-0.1	1.0	65	2.6	10	calcined
Aktifit AM	2.0	10	96.3	-0.1	1.1	65	2.6	9	calcined, amino funktionalized

Structure of Neuburg Siliceous Earth i

Viscosity Component A

MCR 300, cylinder system CC27, measurement 7d after preparing



Compared to the control, the formulations with Neuburg Siliceous Earth show

slight increase in viscosity, especially in the low shear range

⇩

leads to improved storage stability of component A

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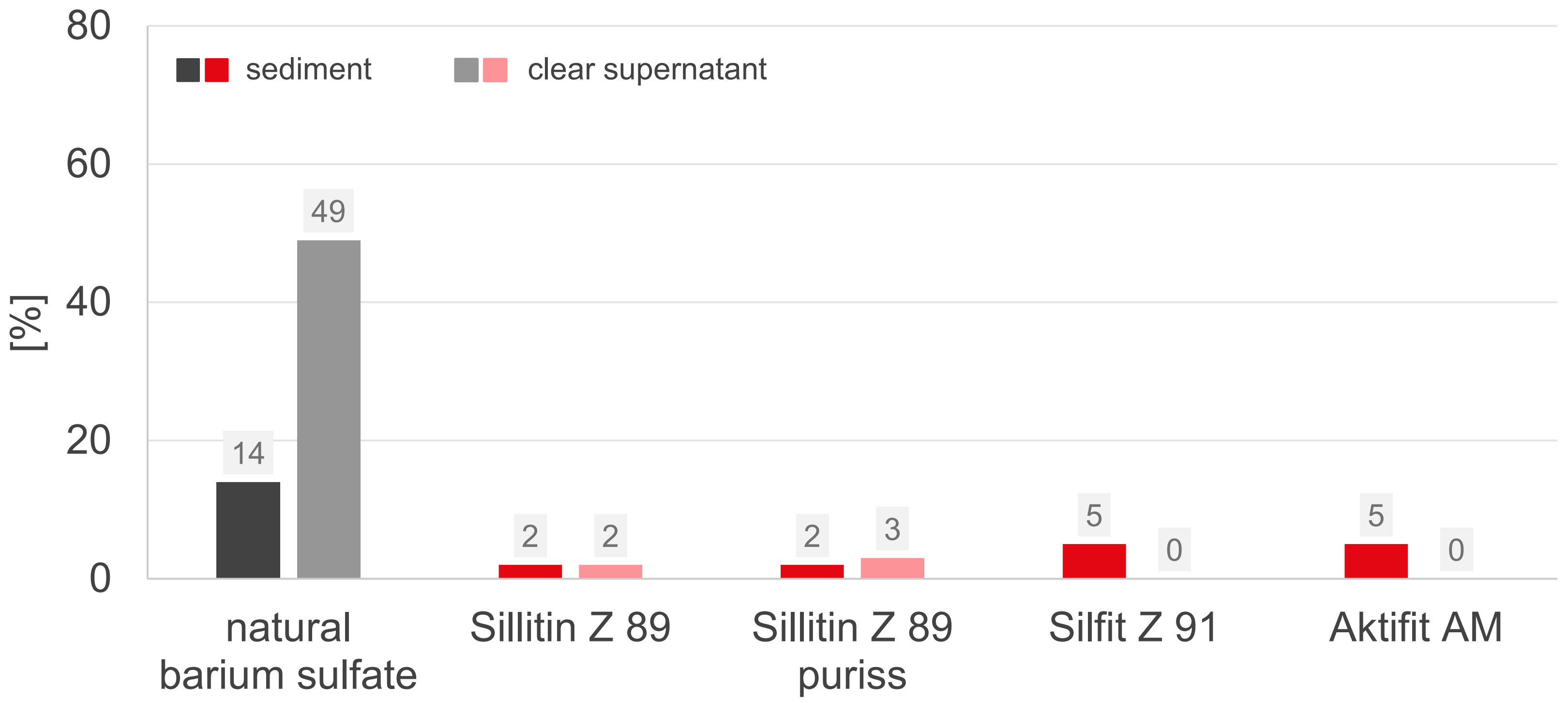
Storage stability Component A

4 weeks at room temperature



Sediment	hard	soft	soft	soft	very soft

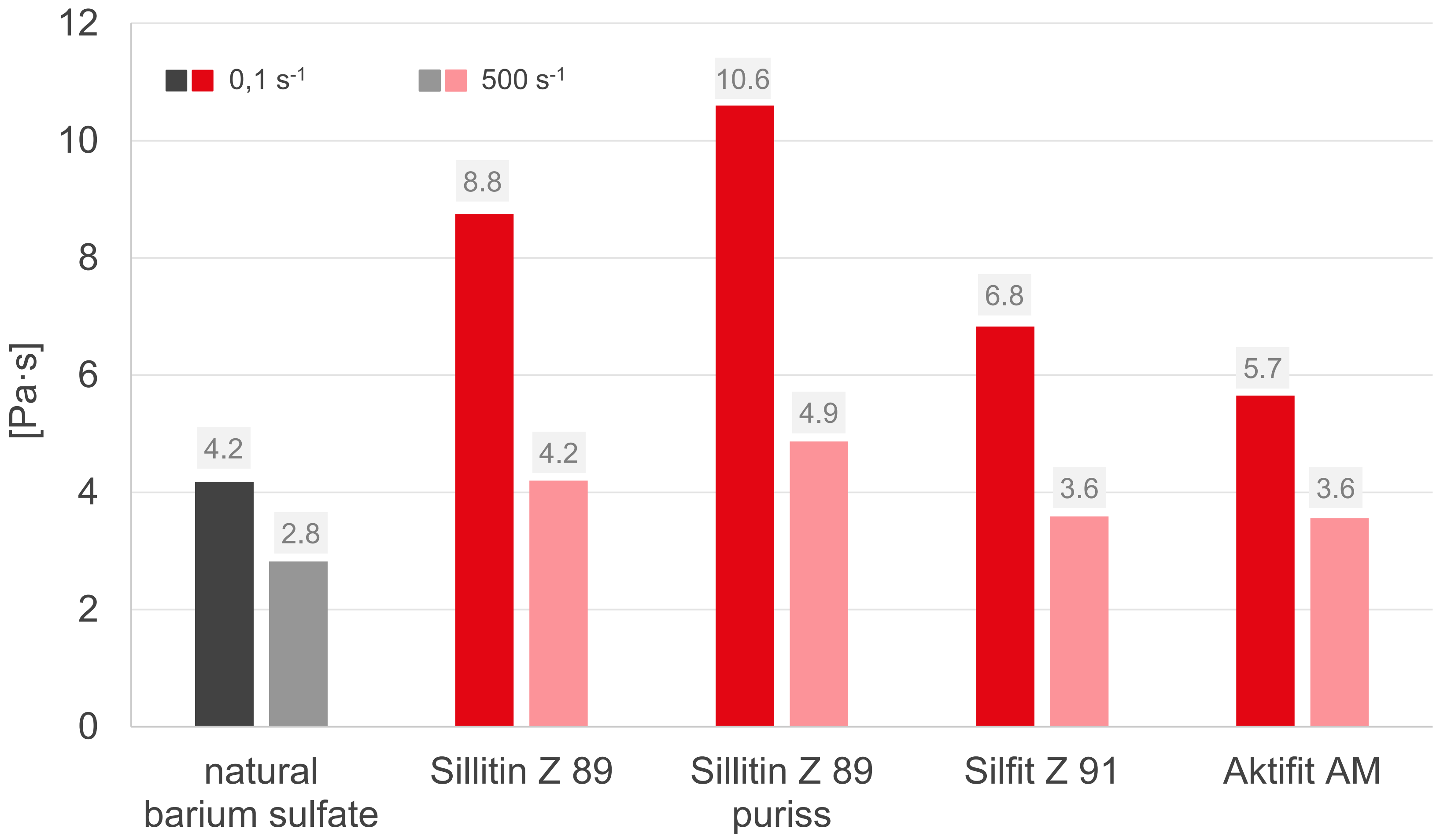
Compared to the control, the formulations with Neuburg Siliceous Earth show

significantly less phase separation

markedly reduced sediment

Viscosity A+B

MCR 300, cylinder system CC27



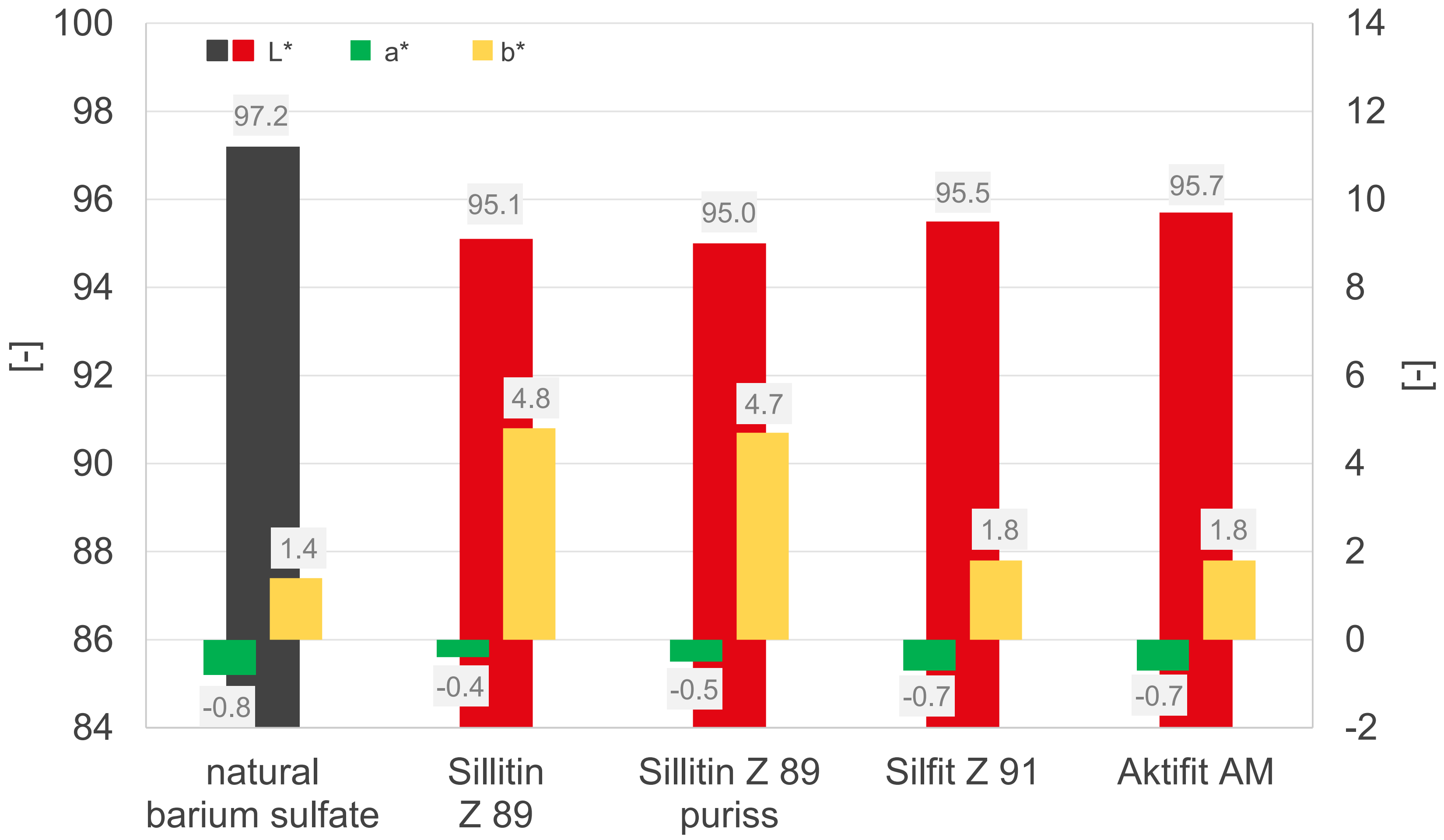
Compared to the control, the formulations with Neuburg Siliceous Earth show

increase in viscosity, especially in the low shear range

without significant impairment of leveling and deaeration

Color CIELab

Measuring geometry d/8°, 300 µm dry film thickness

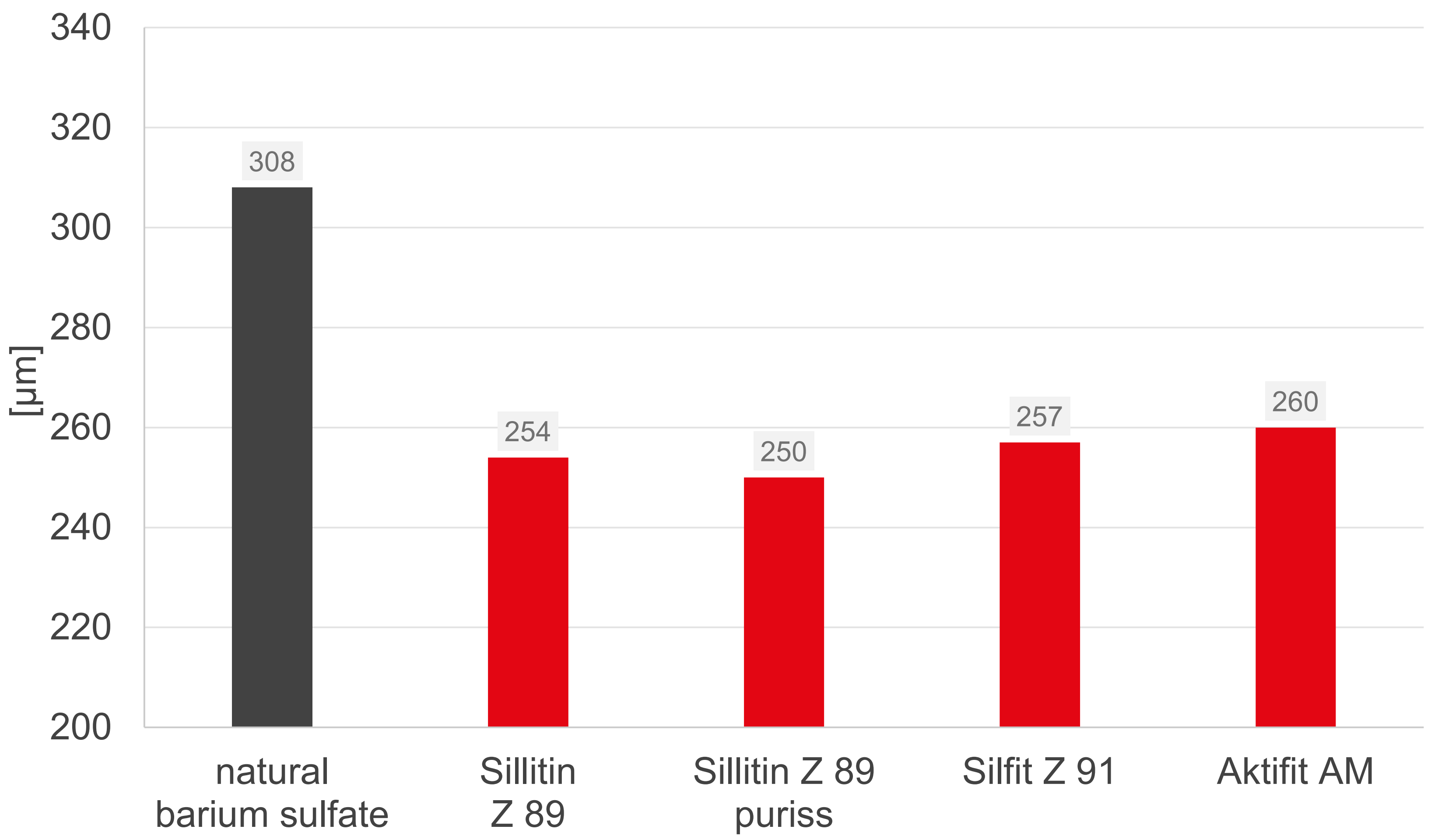


Compared to the control, the formulations with Neuburg Siliceous Earth show

with Sillitin:
slightly higher yellow tint

with Silfit Z 91 / Aktifit AM:
comparable color impression

Required film thickness for contrast ratio 98% as indicator hiding power

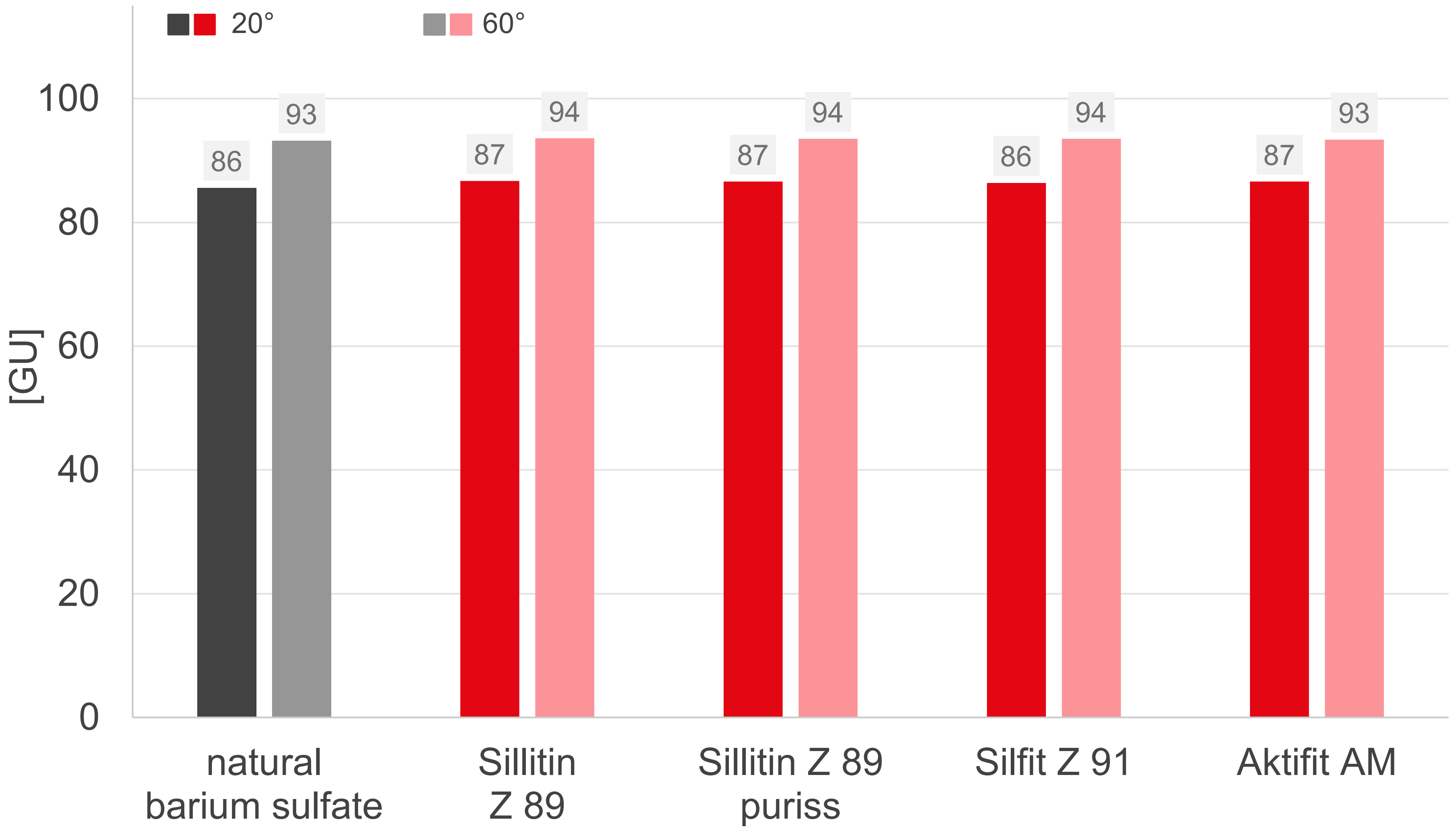


Compared to the control, the formulations with Neuburg Siliceous Earth need

a significantly lower layer thickness for a contrast ratio of 98%

= better hiding power

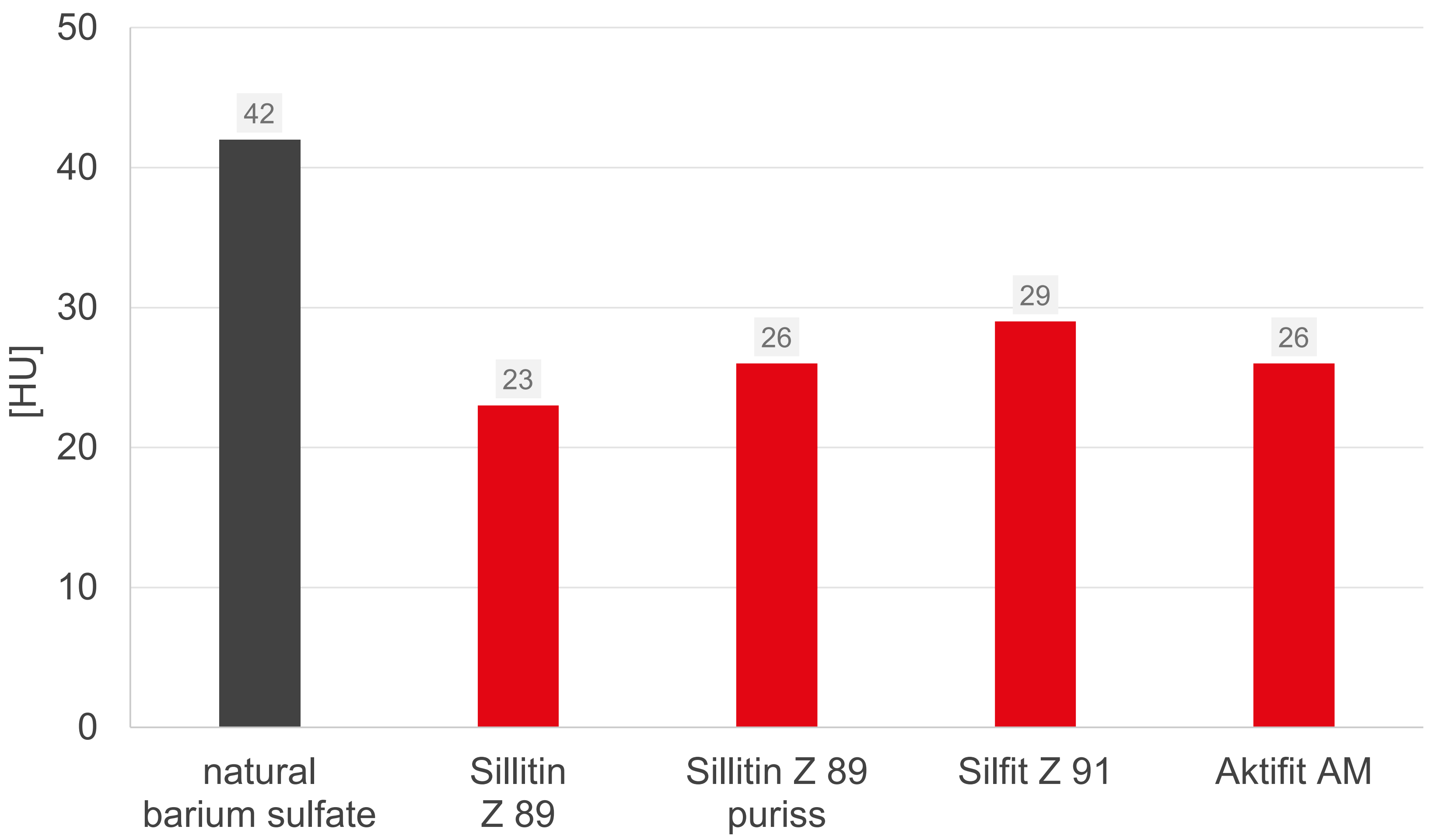
Gloss



Compared to the control, the formulations with Neuburg Siliceous Earth show

identical gloss

Gloss-haze



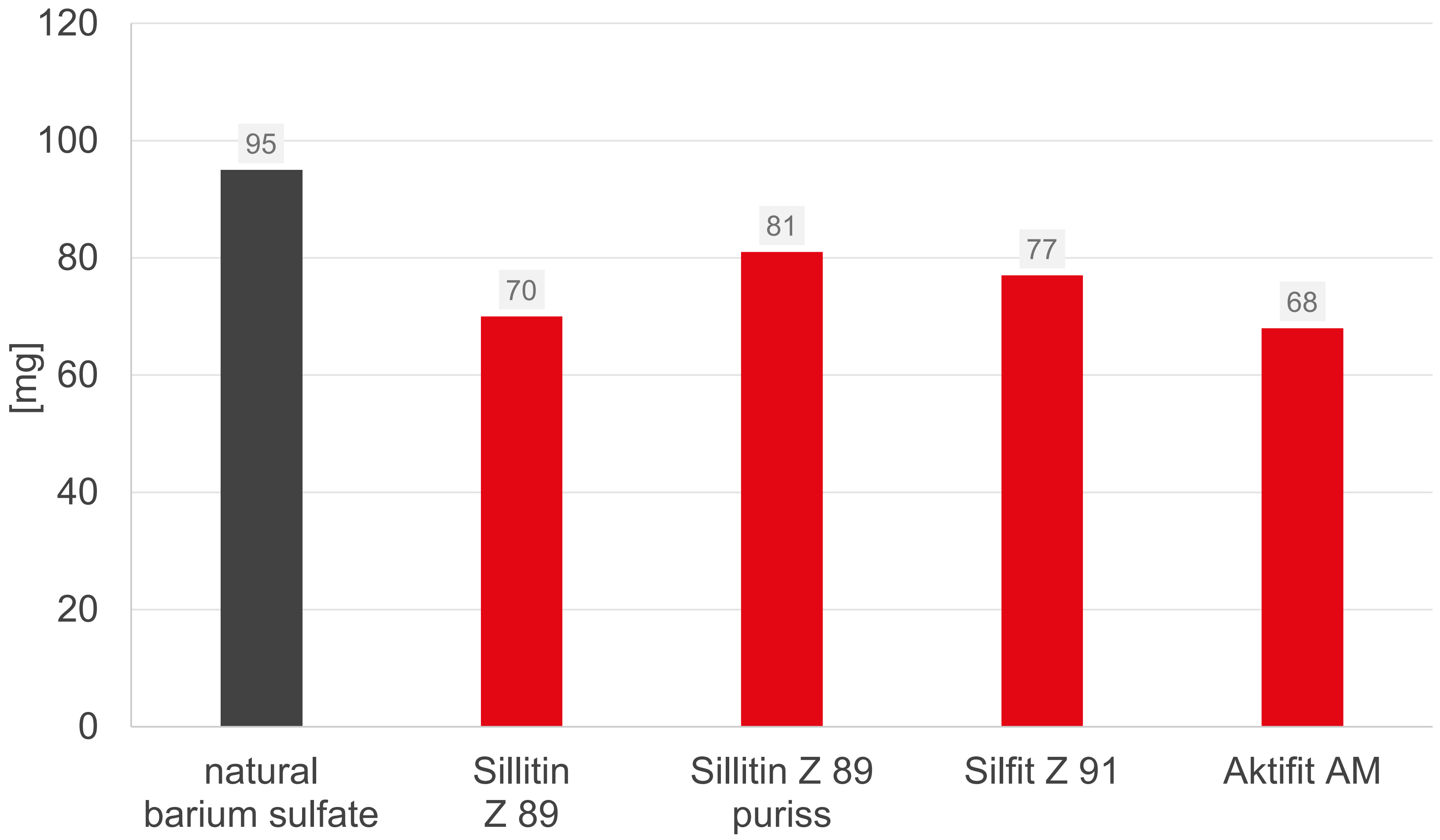
Compared to the control, the formulations with Neuburg Siliceous Earth show

lower gloss-haze
= fewer microstructures

Indication of better compatibility within the formulation and smaller particles

Abrasion resistance S 42

DIN 53754, 5.4 N / 100 rev



Compared to the control, the formulations with Neuburg Siliceous Earth show

improved abrasion resistance against coarser abrasives

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Summary

	natural barium sulfate	Sillitin Z 89	Sillitin Z 89 puriss	Silfit Z 91	Aktifit AM
Viscosity	0	↑	↑	↑	↑
Sedimentation	0	++	++	++	++
Processability Deaeration / Leveling	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0
Optical properties Color, Hiding power Gloss, Haze	0 / 0 0 / 0	- / ++ 0 / +	- / ++ 0 / +	0 / ++ 0 / +	0 / ++ 0 / +
Abrasion loss S 42	0	+	+	+	+
Remarks	strong and rapid sediment formation	slight yellow tint	easier to disperse than Sillitin Z 89	color neutral	color neutral, lowest abrasion loss

Benefits of
Neuburg Siliceous Earth

significantly less phase separation
+ significantly reduced sediment
= better storage stability

better hiding power

lower gloss-haze

improved abrasion resistance with the calcined grades Silfit Z 91 and Aktifit AM

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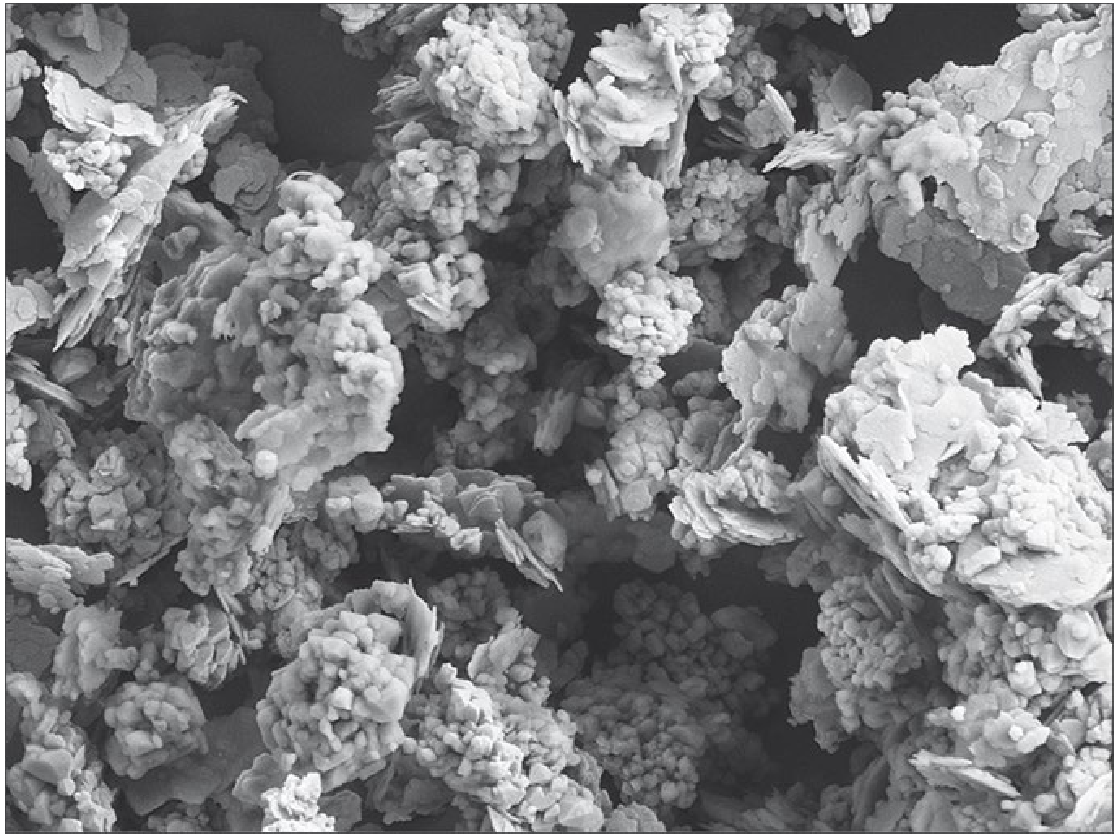
HOFFMANN MINERAL GmbH
Muenchener Straße 75
DE-86633 Neuburg (Donau)

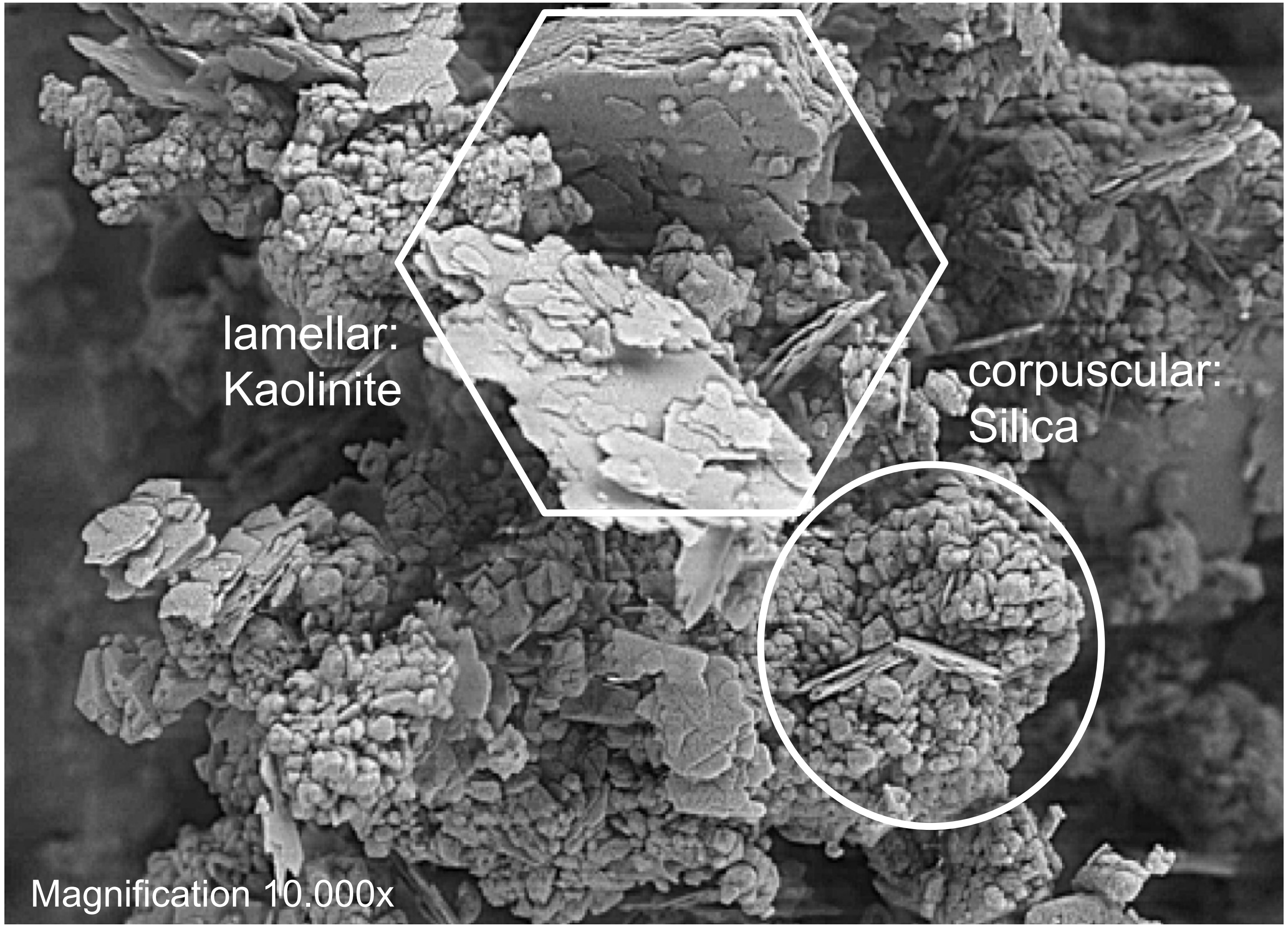
Phone: +49 8431 53-0
Internet: www.hoffmann-mineral.com
E-mail: info@hoffmann-mineral.com

Neuburg Siliceous Earth



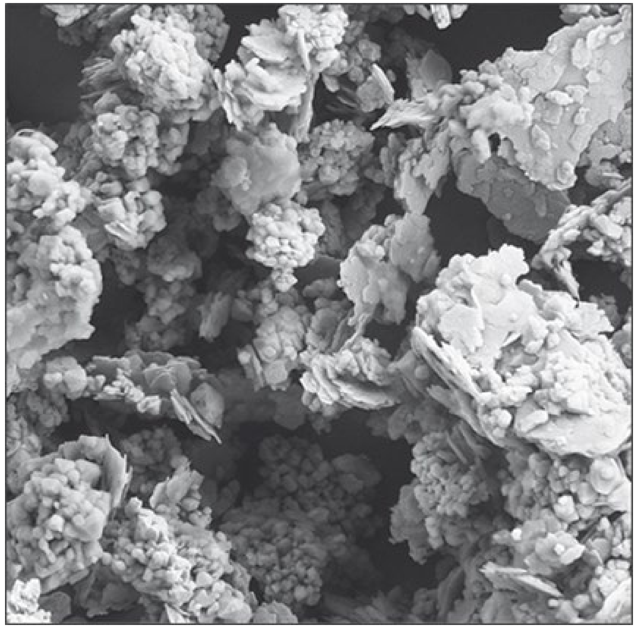
A natural combination of corpuscular Neuburg silica and lamellar kaolinite: a loose mixture impossible to separate by physical methods. The silica portion exhibits a round grain shape and consists of aggregated primary particles of about 200 nm diameter.

Morphology of Neuburg Siliceous Earth



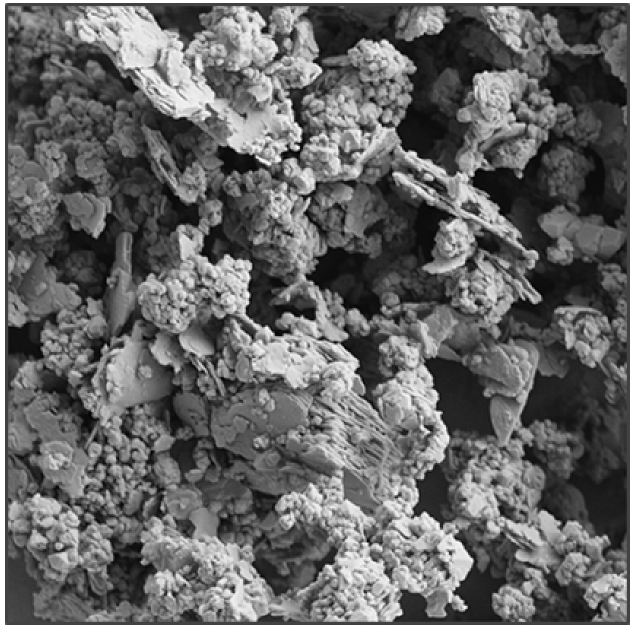
Calcined Neuburg Siliceous Earth

A downstream thermal process lead to the calcined products SILFIT and AKTIFIT, based on SILLITIN Z 86.



Neuburg Siliceous Earth

Calcination Process



Calcined Neuburg Siliceous Earth

Additional application benefits, as well as the removing of crystal water included in the kaolinite. The silica part remains inert.

Preparation

Component A	Dissolver with toothed disc Milling: 15 min @ 11 m/s first part of Desmophen NH 1423 LF, additives, titanium dioxide, filler Target temperature >60 °C (for direct incorporation of Disperbyk 2205) Completion: 5 min @ 4.2 m/s remaining components Allow component A to mature for at least 24 h prior to use.	 Quelle: VMA Getzmann
Mixing A+B	Speedmixer 60 s @ 1000 r/min + 120 s @ 2000 r/min	 Quelle: Hauschild

Tests - Overview

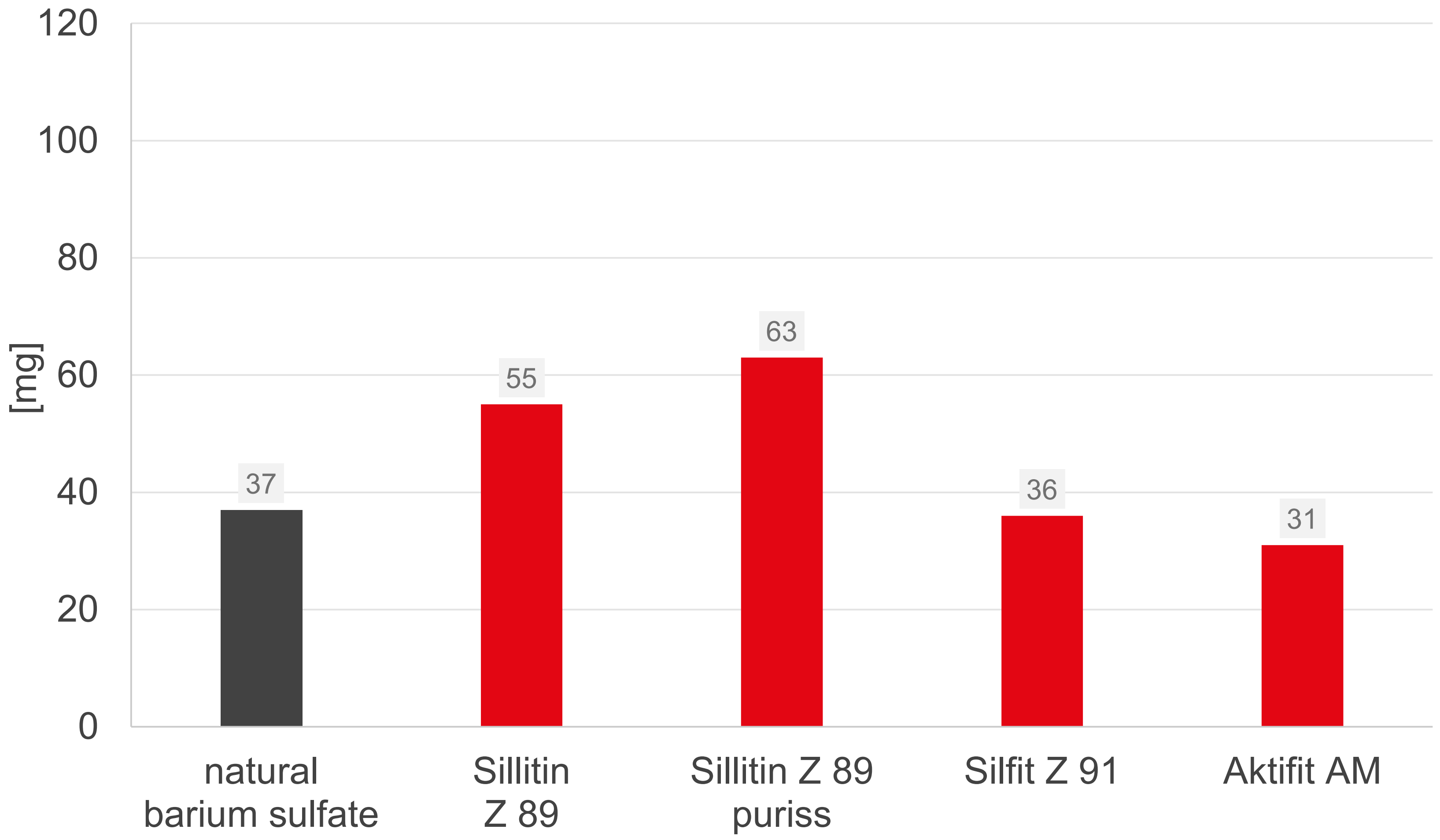
Rheology	MCR 300, CC27, 23 °C, flow curve from 0.1-500 s^{-1}	
Sedimentation	storage 4 weeks at room temperature	
Application	by doctor blade with 510-540 µm gap on Leneta film (results in dry film thickness of approx. 300 µm)	
Drying	at least 3 days in standard climate 23/50	
Color CIELab	X-Rite CI64UV Illuminant D65, normal observer angle 10°, measuring geometry di:8°	
Gloss 20, 60°	Byk micro Tri-Gloss	DIN EN ISO 2813
Gloss-haze	Byk micro haze	
Abrasion resistance	sanding strips S42	DIN 53754, 5.4 N, 100 revolutions

Results in tabular form

			natural barium sulfate	Sillitin Z 89	Sillitin Z 89 puriss	Silfit Z 91	Aktifit AM
Rheology							
Component A	Viscosity @ 0.1 s^{-1} Viscosity @ 500 s^{-1}	Pa·s	1.8 1.4	3.1 1.8	3.1 1.8	2.6 1.9	31 2.0
Component A+B	Viscosity @ 0.1 s^{-1} Viscosity @ 500 s^{-1}	Pa·s	4.2 2.8	8.8 4.2	10.6 4.9	6.8 3.6	5,7 3,6
Storage stability component A, 4 weeks @ room temperature							
Clear supernatant Sediment Appearance of sediment		% % -	49 14 hard	2 2 soft	3 2 soft	0 5 soft	0 5 very soft
Optical properties							
Color CIELab	L* a* b*	- - -	97.2 -0.8 1.4	95.1 -0.4 4.8	95.0 -0.5 4.7	95.5 -0.7 1.8	95.7 -0.7 1.8
Dry film thickness for contrast ratio 98 %		µm	308	254	250	257	260
Gloss	20° 60	GU	86 93	87 94	87 94	86 94	87 93
Gloss-haze		HU	42	23	26	29	26
Mechanical properties							
Abrasion resistance	S 42	mg	95	70	81	77	68

Abrasion loss CS 17

ASTM D 4060, 1 kg / 1000 rev



Compared to the control, the formulations with Neuburg Siliceous Earth show

under mild stress slightly higher abrasion with Sillitin

comparable to slightly improved abrasion resistance with the calcined grades Silfit Z 91 and Aktifit AM