Neuburg Siliceous Earth in UV-curing wood coatings: Transparent primer

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Status Quo

Annual growth has been running at around 10 to 20 % with these systems since the beginning of the 90's due to the increased demand for environmental tolerability (solvent-free) and good mechanical characteristics of UV varnishes.

Basic structure of UV-curing parquet coatings

Surfacer Amount used: 50 g/m² Filler content: 30-40 %	– removes unevenness – avoids sharp outlines – prevents discoloration – high-quality silicate fillers are essential
Primer Amount used: 15-20 g/m² Filler content: 10-15 %	– application after sanding – influence on mechanical properties – addition of small amounts of talc is recommended
Top Coat (clear coat) Film thickness: some µm No filler	– provides a high gloss, smooth surface

Objective

The objective of the present study was to demonstrate the advantages of Neuburg Siliceous Earth over competitive fillers in relation to

- optical properties
- abrasion resistance

in an UV-curing transparent parquet primer.

Base Formulation

Parts by weight

	Control no filler	with filler
Laromer PO 84 F amine group-containing polyether acrylate	100	100
Filler	-	10
Omnirad 500 1-Hydroxy-cyclohexyl-phenyl-ketone and Benzophenone (1:1)	3	3
Total	**103**	**113**

Filler Characteristics

	Talc	Clay	Mica	Sillitin V 88	Aktisil MAM
Mineral Description	Mg-silicate + Magnesite	Al-silicate	Muscovite mica	Silica/ Kaolinite	Silica/ Kaolinite
Grain Shape	lamellar	lamellar	lamellar	corpuscular aggregates and lamellar	corpuscular aggregates and lamellar
Particle Size d_{50} [µm]	4.5 *	4.8 *	10 *	4	4
Particle Size d_{97} [µm]	20 *	---	35 *	18	18
Oil Absoption [g/100 g]	40 *	32 *	50-52 *	45	45
Density [g/cm³]	2,9	2,6	2,8	2,6	2,6
Functionalisation	none	none	none	none	Methacrylic

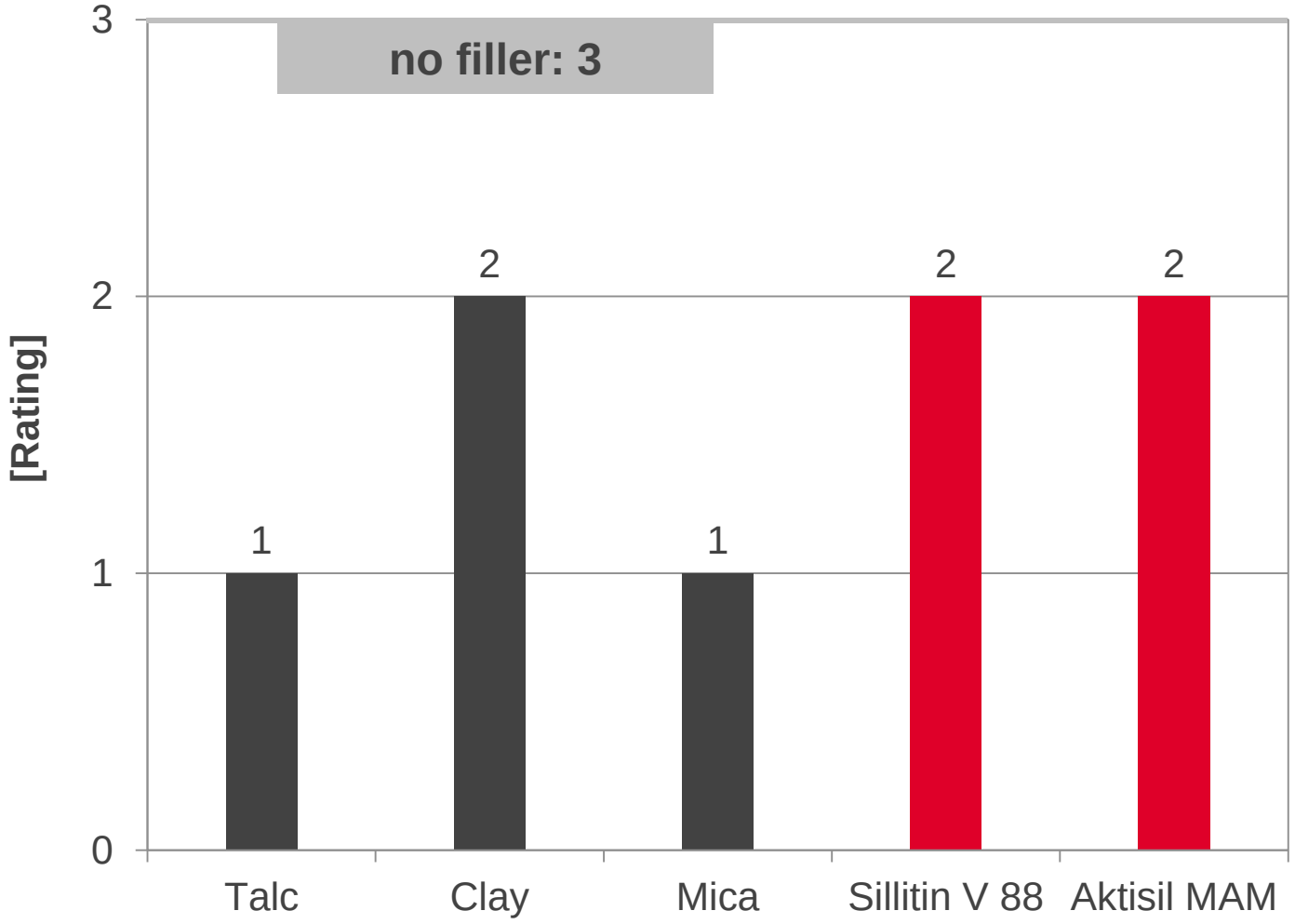
* manufacturer information

Sedimentation

	after 1 d	after 7 d
Talc	no	no
Clay	no	yes
Mica	no	yes
Sillitin V 88	yes	yes
Aktisil MAM	no	no

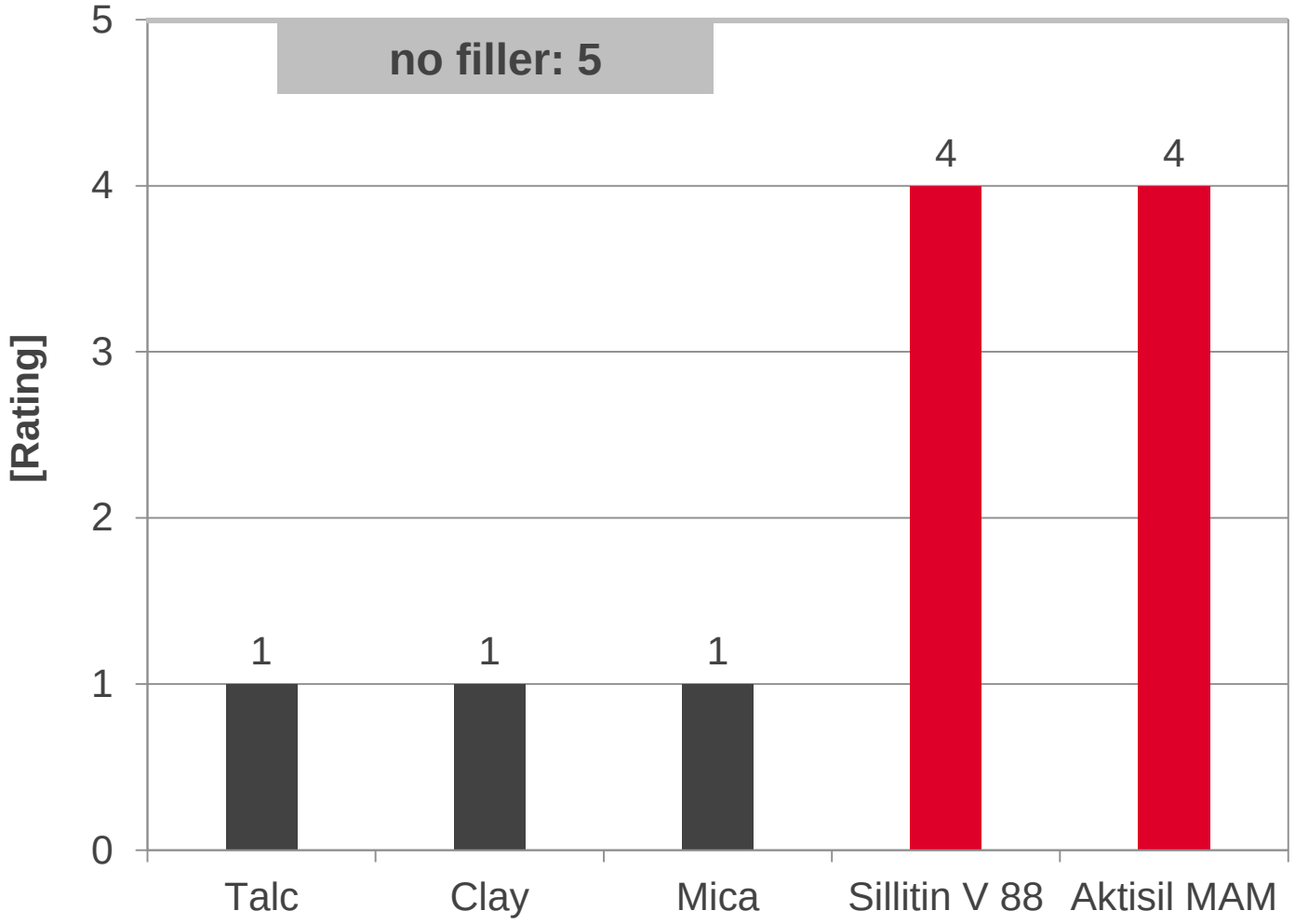
Inherent Color of the Varnish

1 = gray; 2 = low; 3= none



Transparency of the Film

0 = not acceptable; 5 = excellent



Abrasion Loss

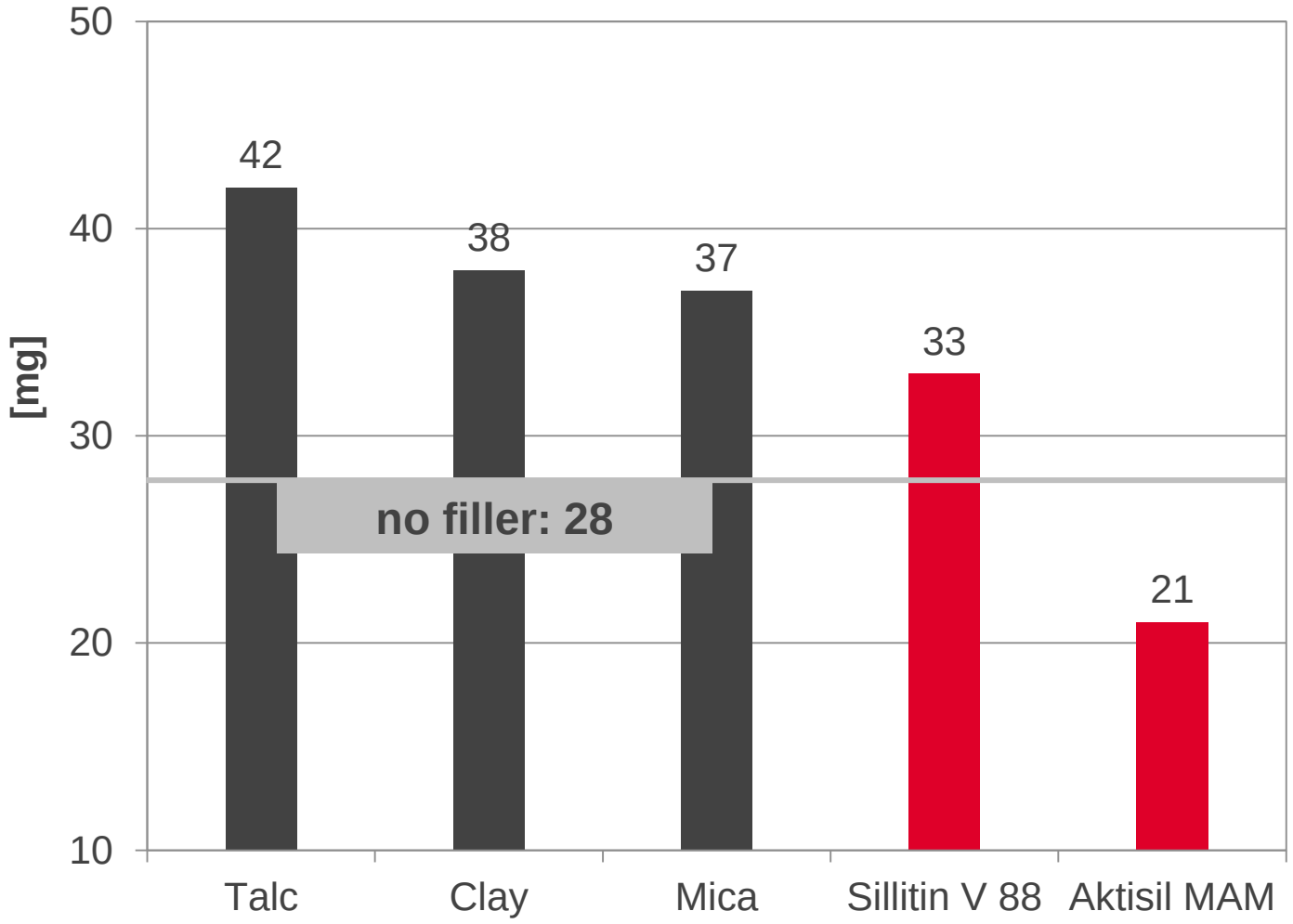
INTRODUCTION

EXPERIMENTAL

RESULTS

SUMMARY

Taber CS 10; 1 kg; 55 rpm; 1000 revolutions



Summary

Compared to widely used competitive fillers, Neuburg Siliceous Earth offers:

- low inherent color of the varnish
- good film transparency
- lower sedimentation tendency with Aktisil MAM
- improved abrasion resistance with Aktisil MAM

Aktisil MAM is an optimal filler in transparent UV-curing parquet primers for dark and light woods.

The sandability by machine is maintained.

Nevertheless, if there is a need for a higher sanding removal, this can be achieved by adding a small amount of talc.

Filler Recommendations

- Sillitin V 88 — good prive/performance ratio, cost-effective
- Aktisil MAM — reduced sedimentation, improved abrasion resistance

Not tested, but additionally recommended:

- Silfit Z 91 — similar to Sillitin V 88, but with highest color neutrality, best dispersion properties, higher gloss
- Aktifit Q — same as Silfit Z 91, but with lower viscosity and improved abrasion resistance
- Aktifit VM — same as Aktifit Q, but improved hiding power in white pigmented coatings without UV-curing problems
- Sillitin Z 89 — same as Sillitin V 88, but with lower color neutrality, higher viscosity, reduced sedimentation, higher gloss
- Sillitin Z 89 puriss — same as Sillitin Z 89, but with improved dispersion
- Aktisil VM 56/89 — same as Sillitin Z 89, but with improved abrasion resistance

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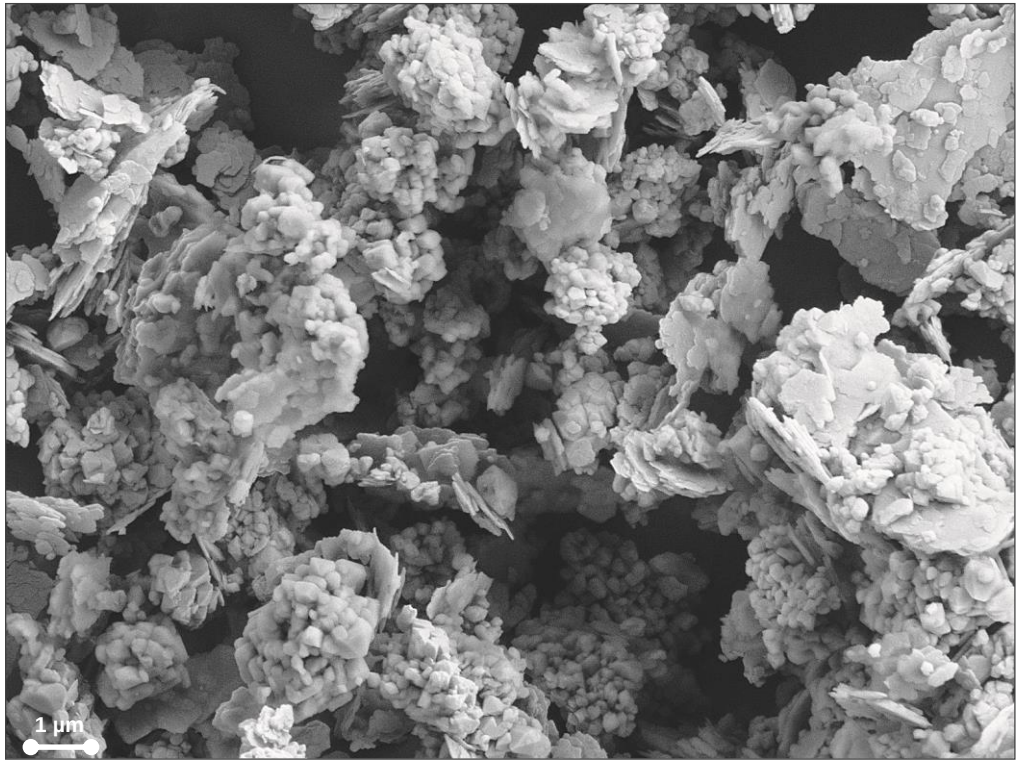
Structure



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

Magnification 10.000x