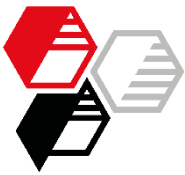




Neuburg Siliceous Earth in water-based corrosion protection DTM acrylate single-layer black

Author: Barbara Mayer



Contents

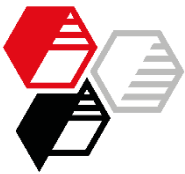
INTRODUCTION

EXPERIMENTAL

RESULTS

SUMMARY

- Introduction
- Experimental
- Results
 - Viscosity
 - Storage stability
 - Gloss
 - Adhesion
 - Corrosion Resistance
 - Humidity Test
 - Salt Spray Test
- Summary



Status Quo

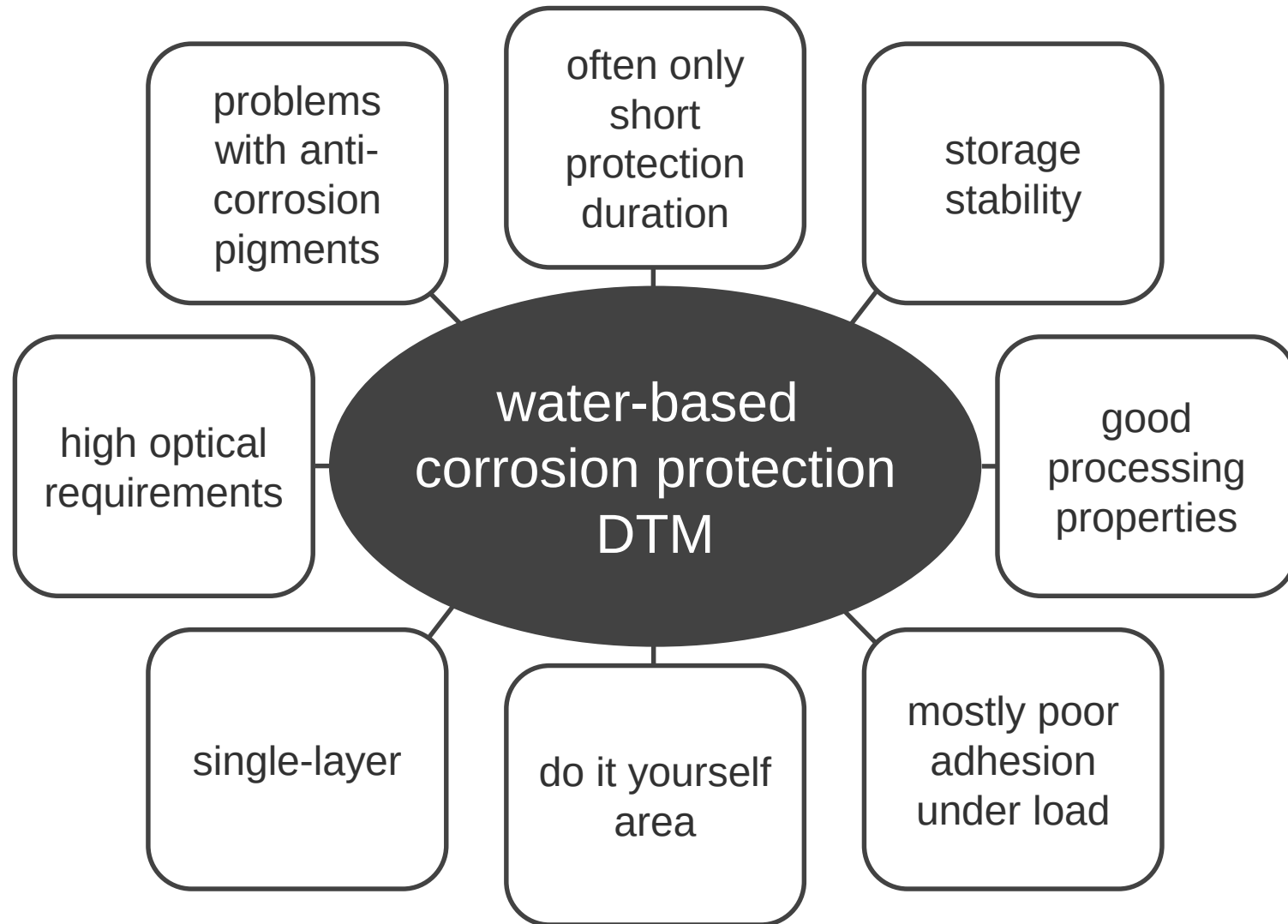
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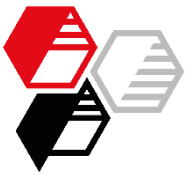
INTRODUCTION

EXPERIMENTAL

RESULTS

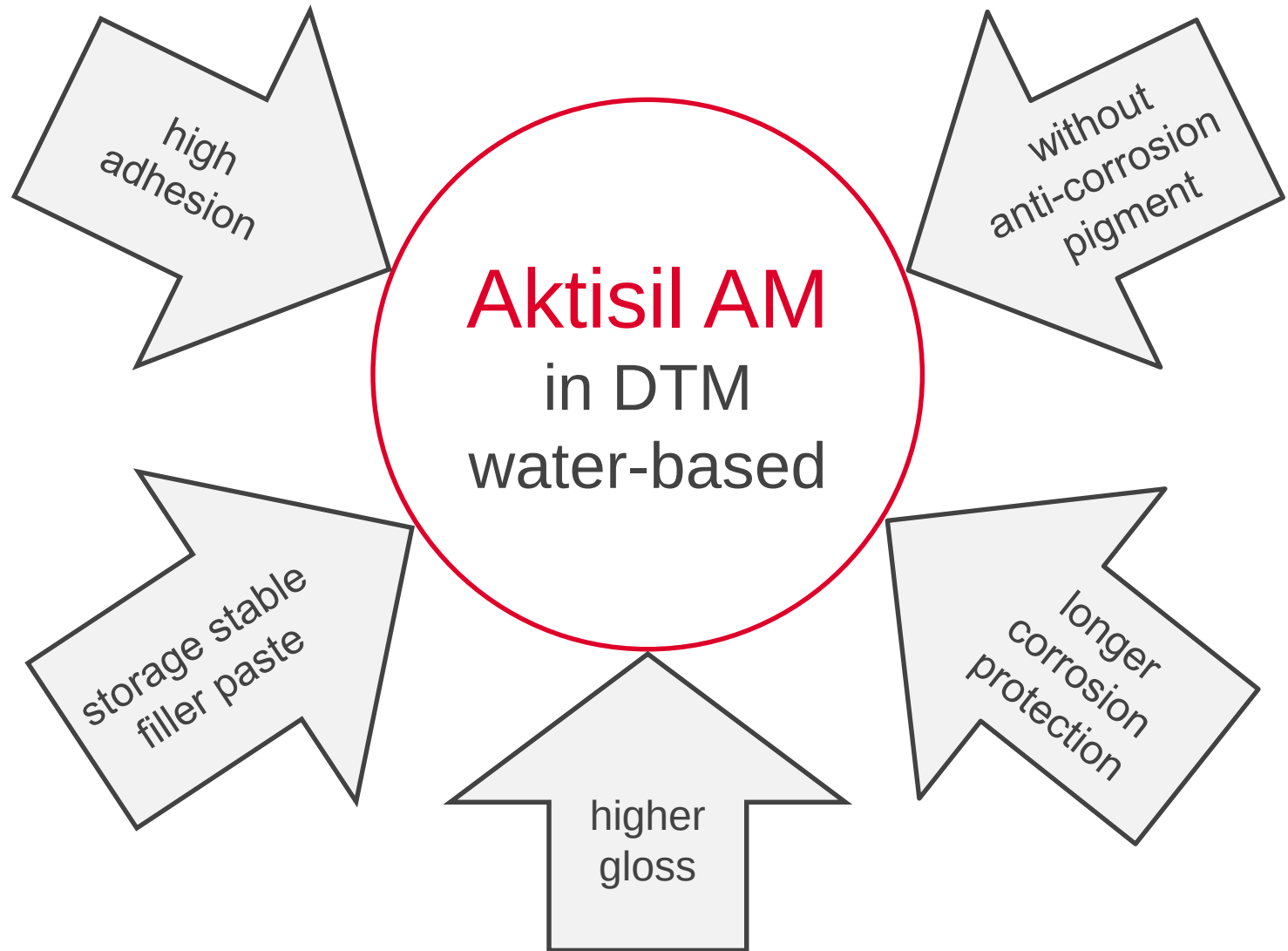
SUMMARY

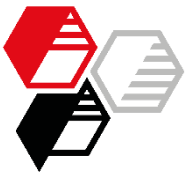




Objective

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Formulation

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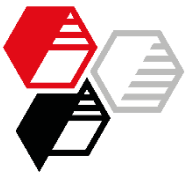
INTRODUCTION

EXPERIMENTAL

RESULTS

SUMMARY

		BaSO ₄	Aktisil AM
Setaqua DTM 6851	Acrylic dispersion	71.40	71.40
Ammonia 25 %	Neutralizing agent	0.20	0.20
Filler paste		19.20	15.95
Pigment paste black		8.45	8.45
Water demineralized		1.00	---
flashproTAC C4E	Flash rust inhibitor	0.20	0.10
BYK 024	Defoamer	0.20	0.10
Asconium 142 DA	Org. corrosion inhibitor	---	2.00
AMP 90	Neutralizing agent	---	0.15
Tego Wet KL 245	Wetting agent	---	0.20
Tego Glide 494	Slip and flow additive	---	0.15
Tafigel PUR 45 (1:1 in H ₂ O)	Thickener	---	1.00
Additol VXW 6387	Anti-settling	0.20	---
Additol XW 6580	Wetting agent	0.25	---
Additol VXW 6388 (1:10 in H ₂ O)	Thickener	2.85	---
Total		103.95	99.70
Pigment volume concentration [%]		12.3	
Solids content w/w [%]		46.2	43.5



Paste Formulations

INTRODUCTION

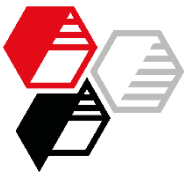
EXPERIMENTAL

RESULTS

SUMMARY

Filler		BaSO ₄	Aktisil AM
Water demineralized		17.65	28.07
Additol XW 6588	Dispersing additive	3.00	3.00
BYK 024	Defoamer	1.60	1.60
Dowanol DPM		3.00	3.00
Aerosil R 972	Thickener	0.20	---
Barium sulfate natural	Filler	55.10	---
Aktisil AM	Filler	---	47.41
Nubirox 102	Anti-corrosion pigment	17.70	---
Additol VXW 6388	Thickener	0.25	---
Rheobyk 7420 ES	Thickener	1.50	---
Total		100.00	83.08

Black		
Water demineralized		74.90
Surfynol 104 E	Surfactant	0.40
Colour Black OE 430W	Pigment black	24.70
Total		100.00



Filler Characteristics

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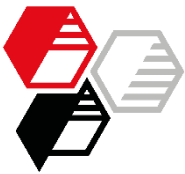
INTRODUCTION

EXPERIMENTAL

RESULTS

SUMMARY

	Barium sulfate natural (BaSO ₄)	Aktisil AM
Particle size d ₅₀ [μm]	2.9	2.2
Particle size d ₉₇ [μm]	14	10
Oil absorption [g/100g]	14	45
Specific surface area [m ² /g]	0.8	9
Density [g/cm ³]	4.4	2.6
Functionalization	---	Amino



Preparative Methods

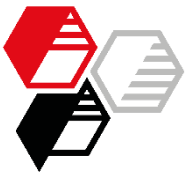
INTRODUCTION

EXPERIMENTAL

RESULTS

SUMMARY

Mixing	<u>Filler paste:</u> • Dissolver with adapted bead mill • 10 min at 6.0 m/s • beads v/v 1:1 <u>Pigment paste black:</u> • Dissolver with toothed disc • 20 min at 4.2 m/s <u>Completion:</u> • Dissolver with toothed disc • After addition of all components final 5 min at 2.5 m/s
Application	Doctor blade Application viscosity: 400 to 500 mPa·s at 25 s⁻¹ BaSO₄-formulation: undiluted Aktisil AM-formulation: diluted with 10 % water Substrate: cold rolled steel, Q-Panel Type R 48 DFT ca. 80 µm
Drying conditions	Gloss, adhesion: 23 °C / 50 % relative humidity, 7 d Corrosion protection tests: dust-dry, then 30 min 60 °C



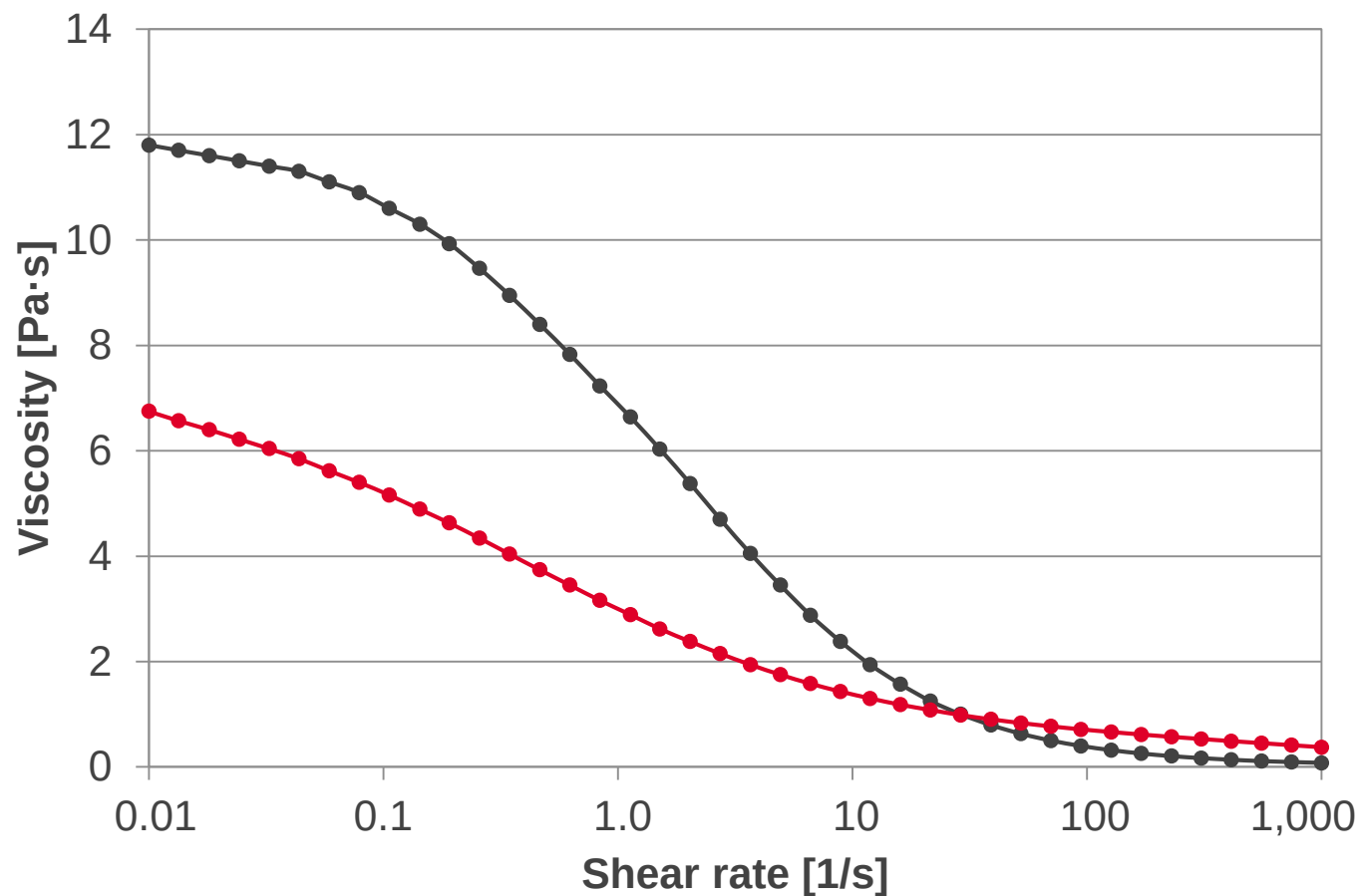
Viscosity

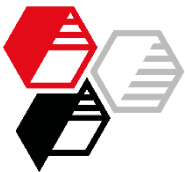
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MCR 300 with CC17 after 35 d

—●— BaSO_4

—●— Aktisil AM





Storage Stability 8 Weeks 40 °C

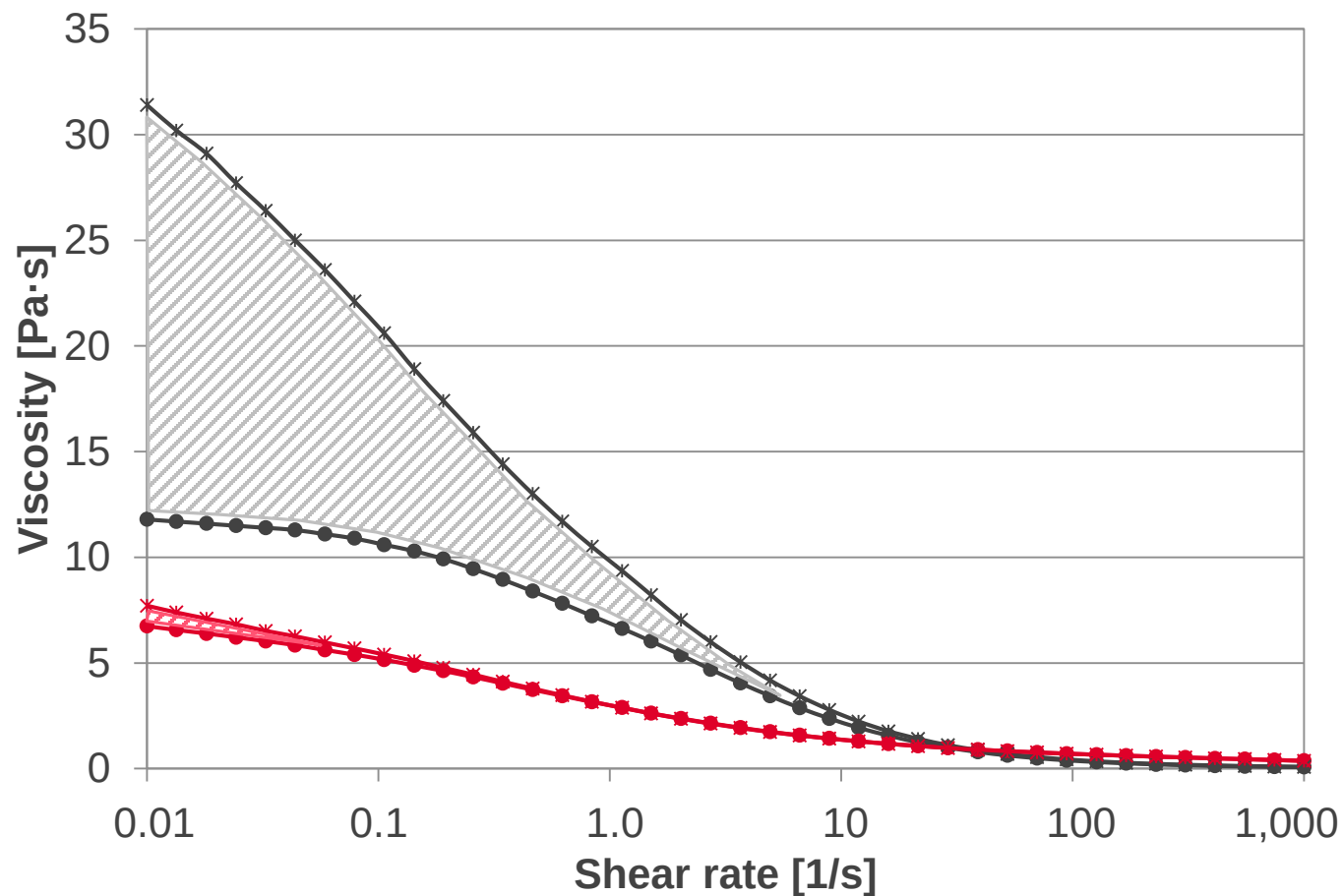
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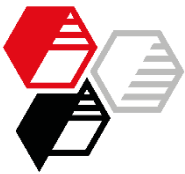
MCR 300 with CC17

BaSO₄ ●
✱

before
after

● ✱ Aktisil AM

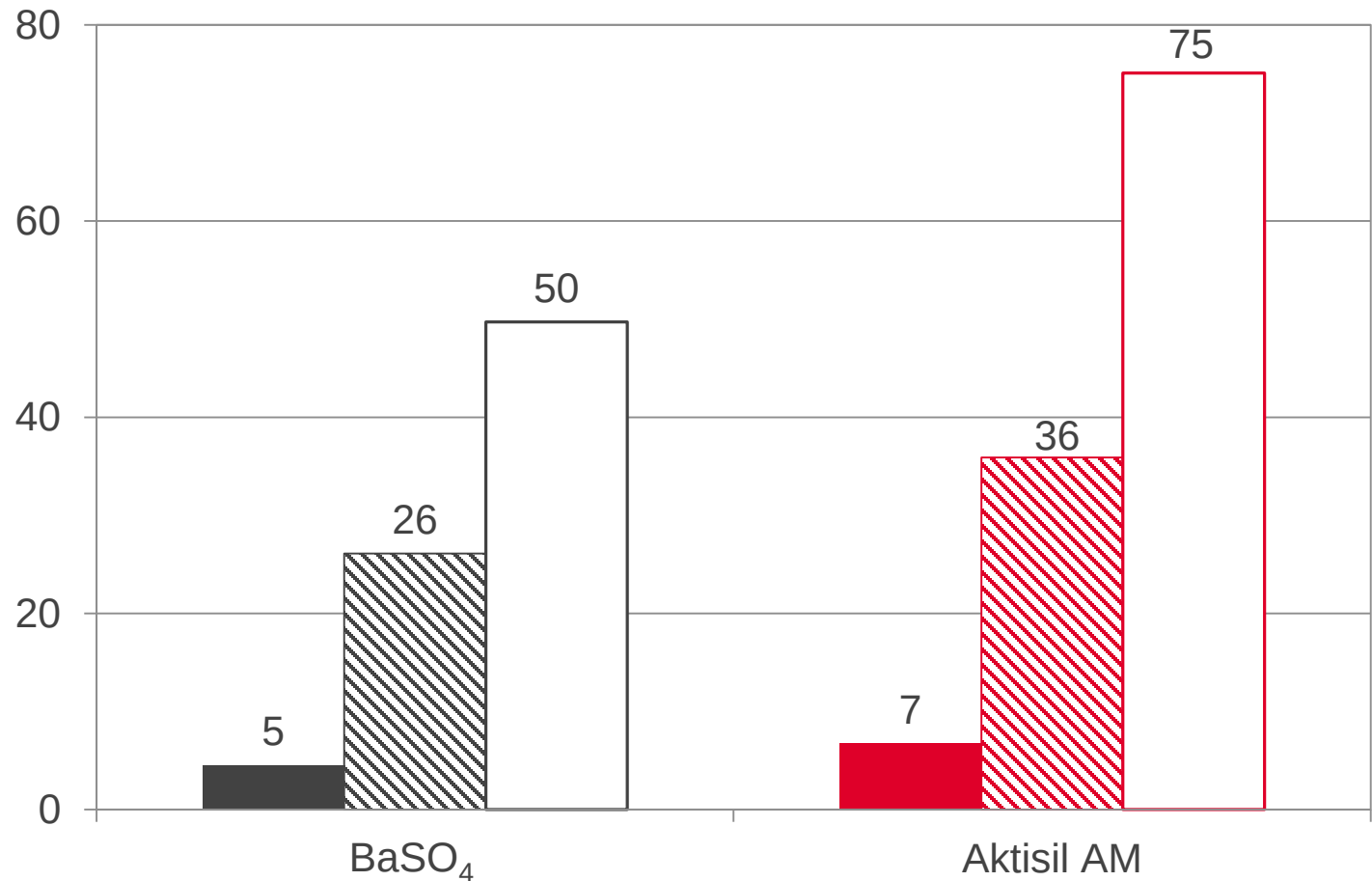


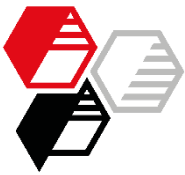


Gloss

micro-TRI-gloss, [GU]

■ 20° ▨ 60° □ 85°



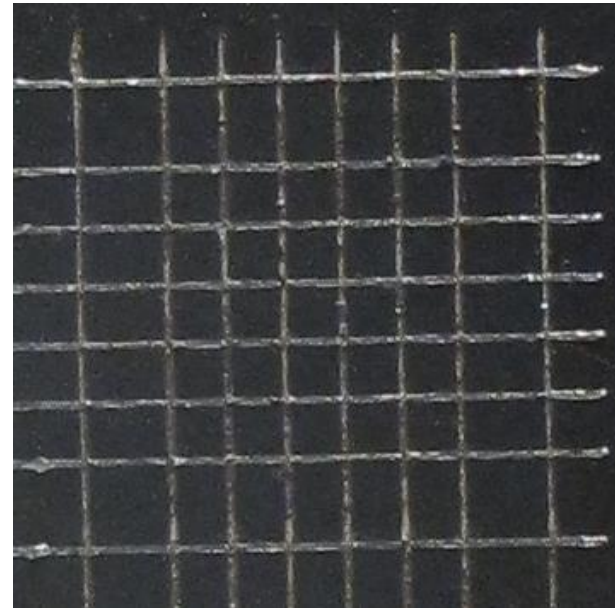


Adhesion

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Cross-cut test 2 mm with tape

All formulations
show excellent
adhesion to the substrate,
cross-cut rating: 0

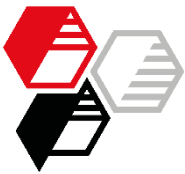


INTRODUCTION

EXPERIMENTAL

RESULTS

SUMMARY



Corrosion Protection Tests

Evaluation criteria

Humidity test DIN EN ISO 6270-2 CH

Panel without
scribe

- Adhesion

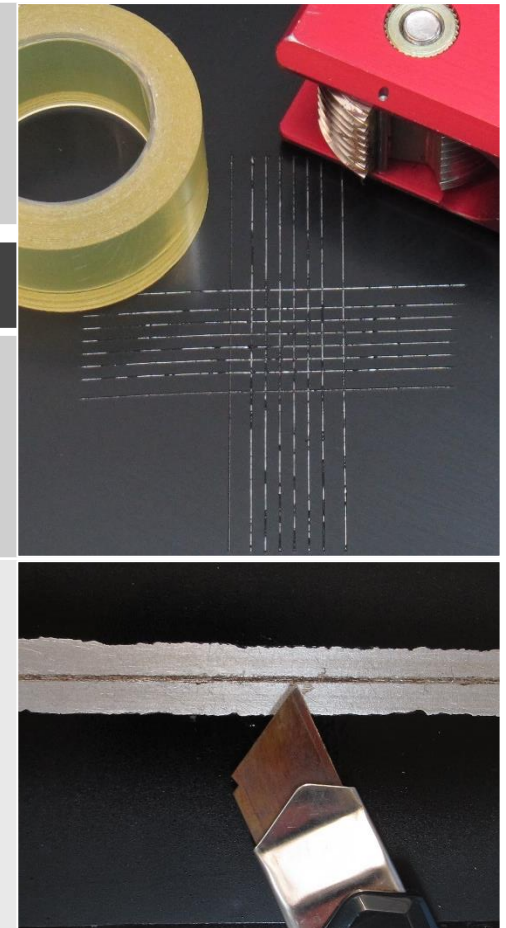
Salt spray test DIN EN ISO 9227 NSS

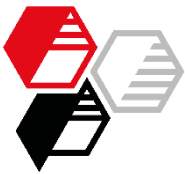
Panel without
scribe

- Adhesion

Panel with
scribe
Sikkens 1 mm
10 cm long

- Delamination

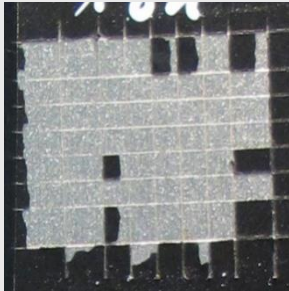
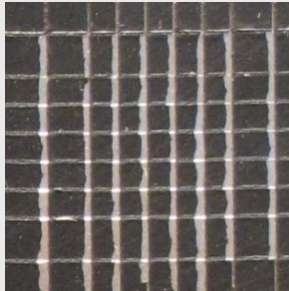
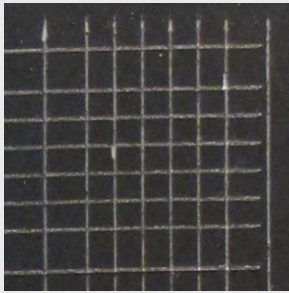
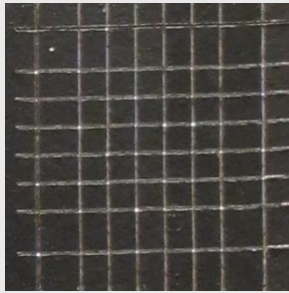


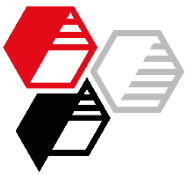


Humidity Test Adhesion

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Cross-cut test 2 mm with tape

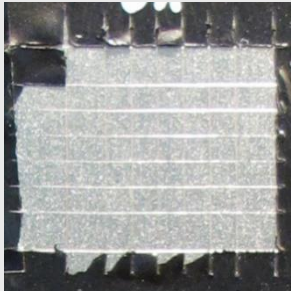
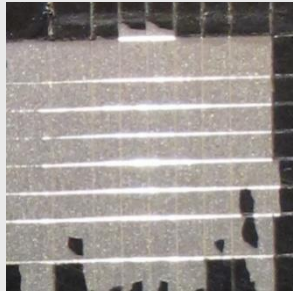
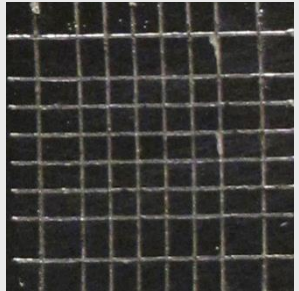
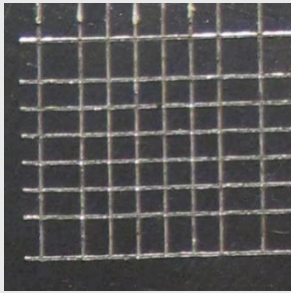
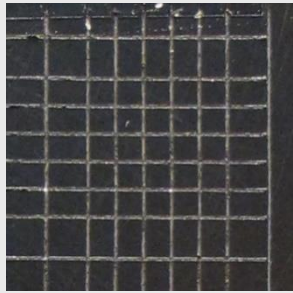
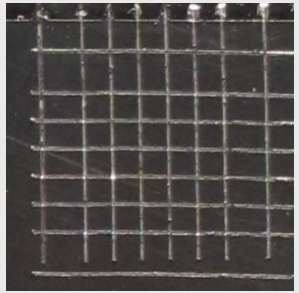
Test duration	18 h	250 h
Regeneration time 23 °C, 50 % rel. H.	1 h	24 h
BaSO ₄		
value	5	1
Aktisil AM without anti- corrosion pigment		
value	0	0

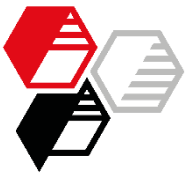


Salt Spray Test Adhesion

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Cross-cut test 2 mm with tape

Test duration	18 h	250 h	
Regeneration time 23 °C, 50 % rel. H.	1 h	1 h	24 h
BaSO ₄			
value	5	5	0
Aktisil AM without anti- corrosion pigment			
value	0	0	0



Salt Spray Test Delamination at Scribe

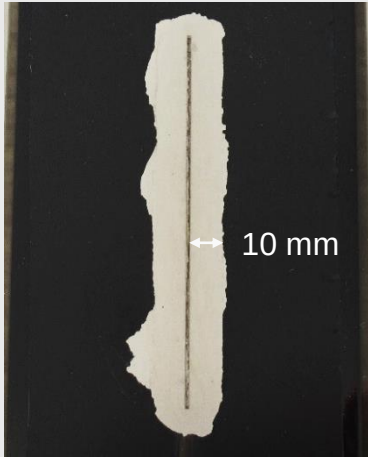
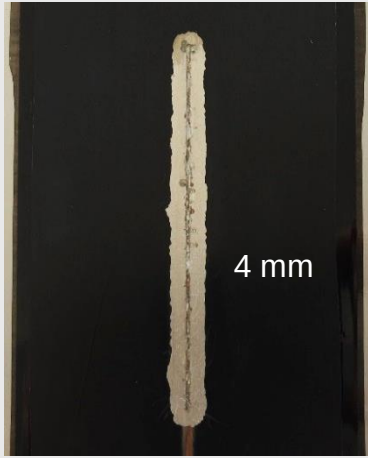
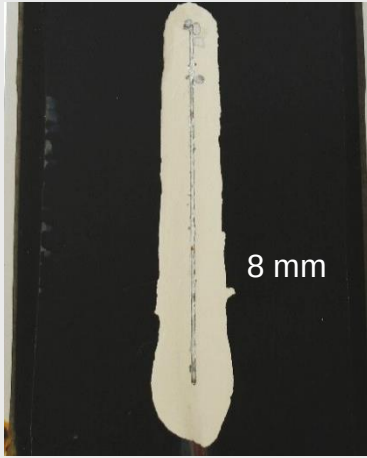
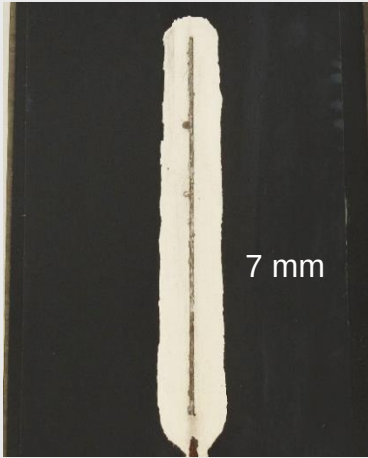
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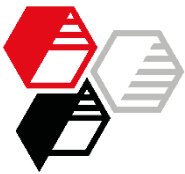
INTRODUCTION

EXPERIMENTAL

RESULTS

SUMMARY

Test duration	90 h	250 h	
Regeneration time 23 °C, 50 % rel. H.	24 h	1 h	24 h
BaSO ₄	 10 mm	 Completely delaminated	 16 mm
Aktisil AM without anti- corrosion pigment	 4 mm	 8 mm	 7 mm



Salt Spray Test Delamination at Scribe

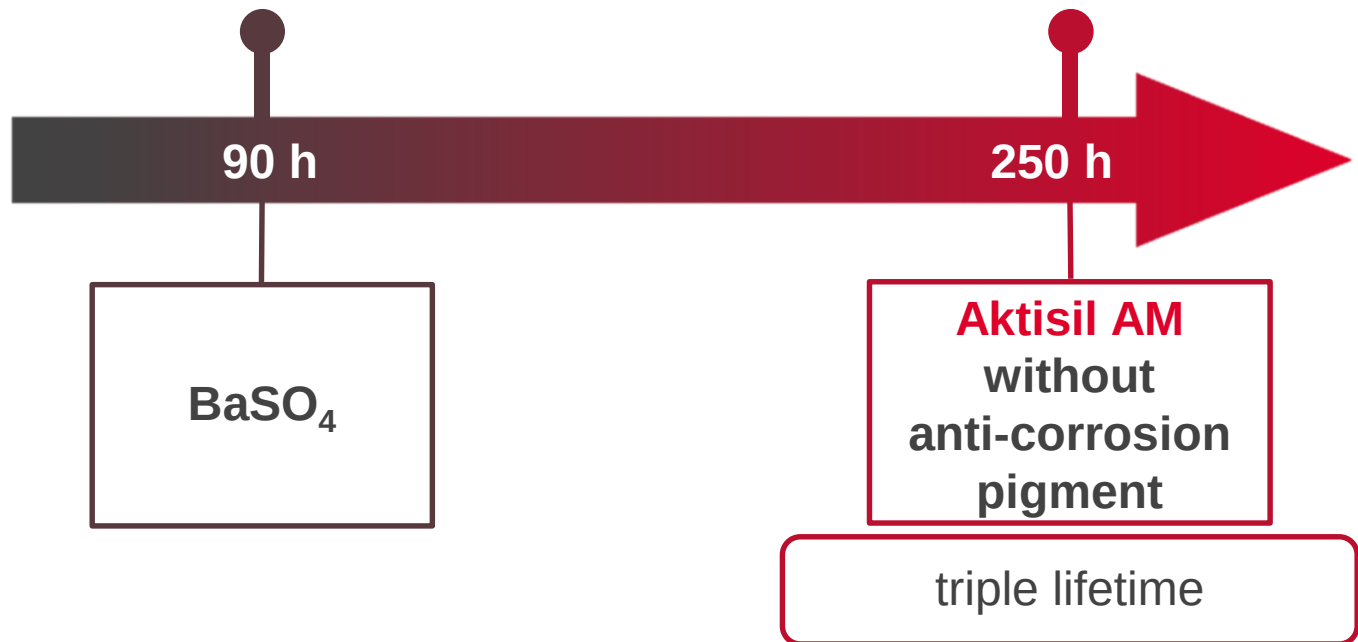
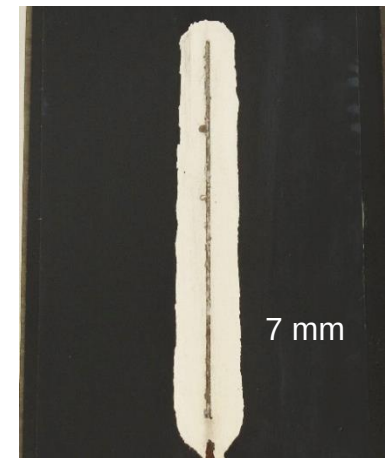
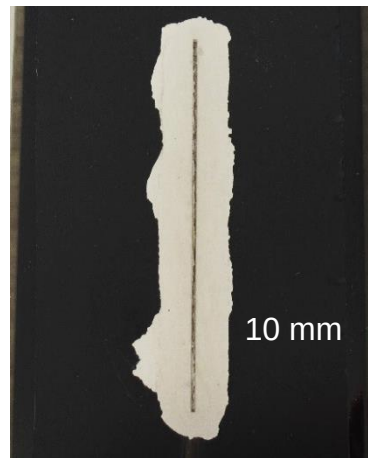
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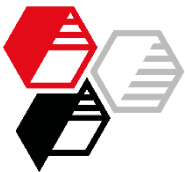
INTRODUCTION

EXPERIMENTAL

RESULTS

SUMMARY





Cross Check: Barium Sulfate in the Aktisil AM Formulation

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250 h NSS and 24 h Regeneration time at 23 °C, 50 % rel. Humidity

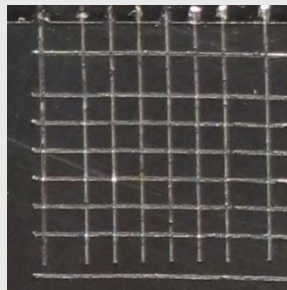
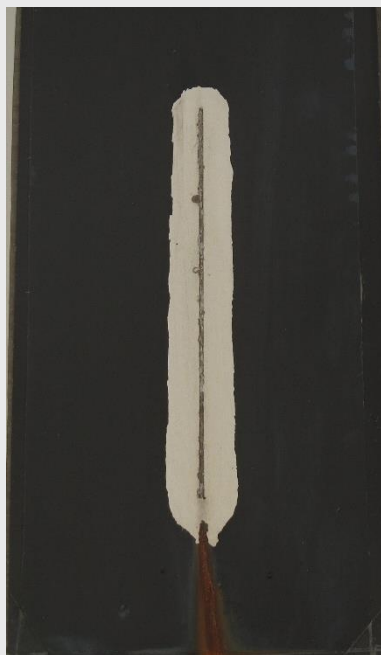
INTRODUCTION

EXPERIMENTAL

RESULTS

SUMMARY

Aktisil AM

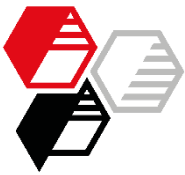


Delamination: 7 mm
Cross-cut: 0

BaSO₄



Delamination: complete
Cross-cut: 5



Summary

INTRODUCTION

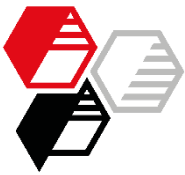
EXPERIMENTAL

RESULTS

SUMMARY

Advantages of surface-treated Neuburg Siliceous Earth
Aktisil AM in the tested single-layer system (DTM) acrylate:

- + Filler paste preparation is already storage stable without thickener
- + Liquid laquer with higher rheological stability during storage
- + Higher gloss
- + Good adhesion to the substrate, even in the wet condition during corrosion exposure
- + Improvement of delamination at the scribe, even in the wet condition during corrosion exposure
- + High performance with anti-corrosion inhibitor instead of anti-corrosion pigment



We supply material for good ideas!

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

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

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