Calcined Neuburg Siliceous Earth
Silfit Z 91 in silicone rubber

Author: Nicole Holzmayr

Contents

Status Quo

For some formulations in silicone rubber, filler loadings in a range of 25 to 75 phr are asked for.

For some products with low requirements the use of non-surface-treated quartz flour often is sufficient so that using Aktisil Q is not necessary.

Hoffmann Mineral is now able to offer an alternative product for non-surface-treated quartz flour, the **Calcined Neuburg Siliceous Earth Silfit Z 91**, which is more cost-effective than Aktisil Q, on the one hand. On the other hand, it puts forward some advantages over quartz flour.

Objective

INTRODUCTION

EXPERIMENTAL

RESULTS

SUMMARY

Demonstrating the advantages of the

Calcined Neuburg Siliceous Earth Silfit Z 91

over the commonly used non-surface-treated quartz flour in silicone rubber regarding

- processing and worker protection
- mechanical properties
- extrusion
- color
- blooming

in combination with bis-(2,4-dichlorobenzoyl)peroxide (**Curing Agent E**) for **extrusion products** resp. 2,5-bis-(t-butylperoxy)-2,5-dimethyl-hexane (**Curing Agent C6**) for **molded parts**.

Fillers, Characteristics

INTRODUCTION

EXPERIMENTAL

RESULTS

SUMMARY

	Particle Size		Oil absorption	Specific surface area BET	Calcination
	d_{50} [µm]	d_{97} [µm]	[g/100g]	[m²/g]	
Silfit Z 91	2.0	10	60	6.5	yes
Quartz flour	3.1	13	31	3.6	no

Preparation and Curing of the Compound

- **Mixing**

  Open mill Ø 150 x 300 mm

  Batch volume: approx. 750 g

  Temperature: 20 °C

  Mixing time: approx. 13 min.

- **Curing**

  Press, 165 °C, 5 min. – for Curing Agent C6

  Press, 115 °C, 5 min. – for Curing Agent E

  Post-cure, 200 °C, 4 h

Overview

- Moldings – Curing Agent C6
- Extrusion – Curing Agent E
- Color
- Processing and worker protection
- Summary

Formulation - Moldings
Curing Agent C6

INTRODUCTION

EXPERIMENTAL

Moldings

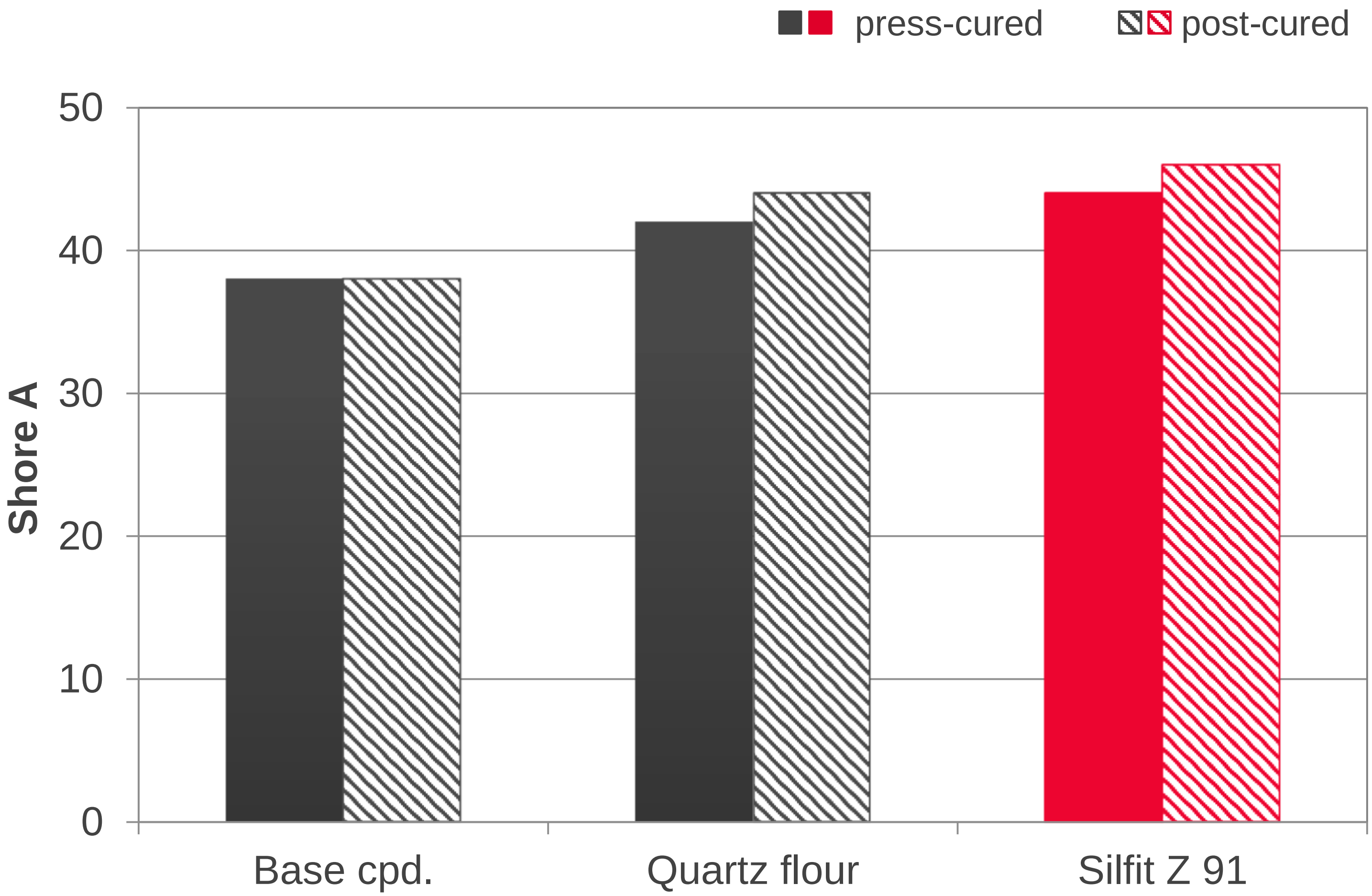
RESULTS

SUMMARY

in phr	Base cpd.	Quartz flour	Silfit Z 91
Quartz flour	-	25	-
Silfit Z 91	-	-	25
Curing Agent C6		1.2	
Elastosil R 401/40		100	

Hardness

DIN 53 505-A, piled-up S2-dumbbells



Tensile Strength

INTRODUCTION

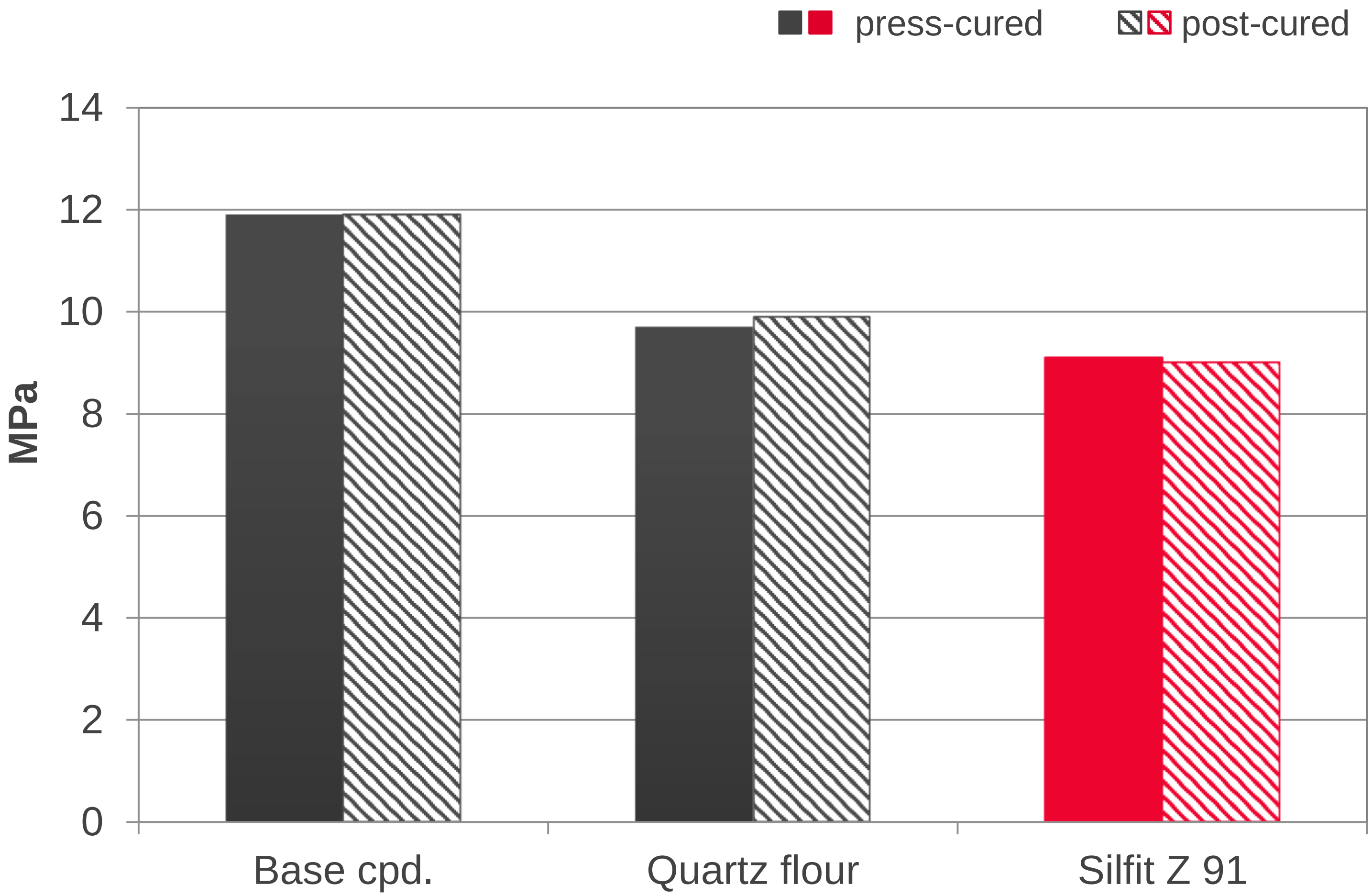
EXPERIMENTAL

RESULTS

Moldings

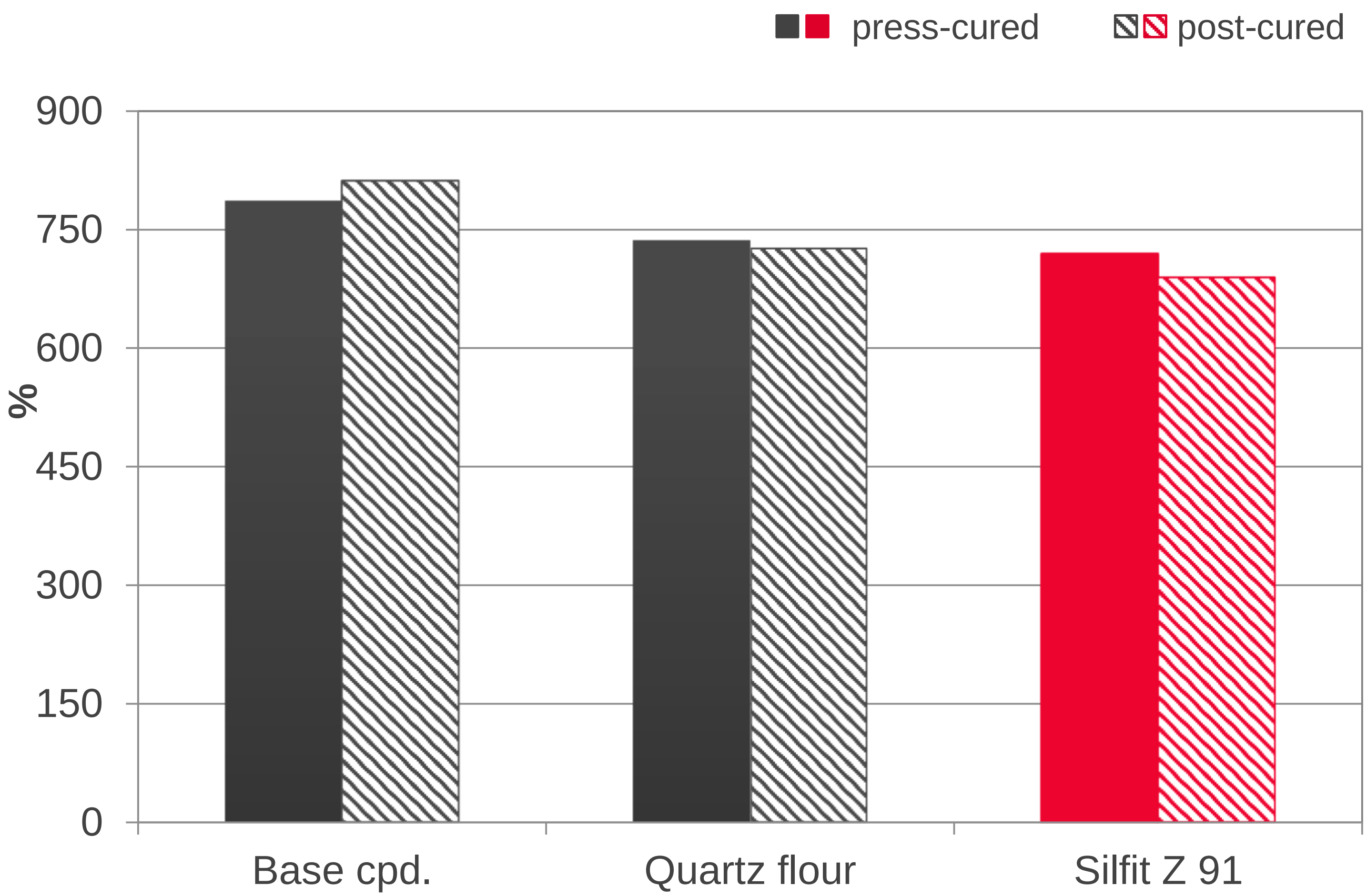
SUMMARY

DIN 53 504, S2



Elongation at Break

DIN 53 504, S2



Tear Resistance

HOFFMANN MINERAL

INTRODUCTION

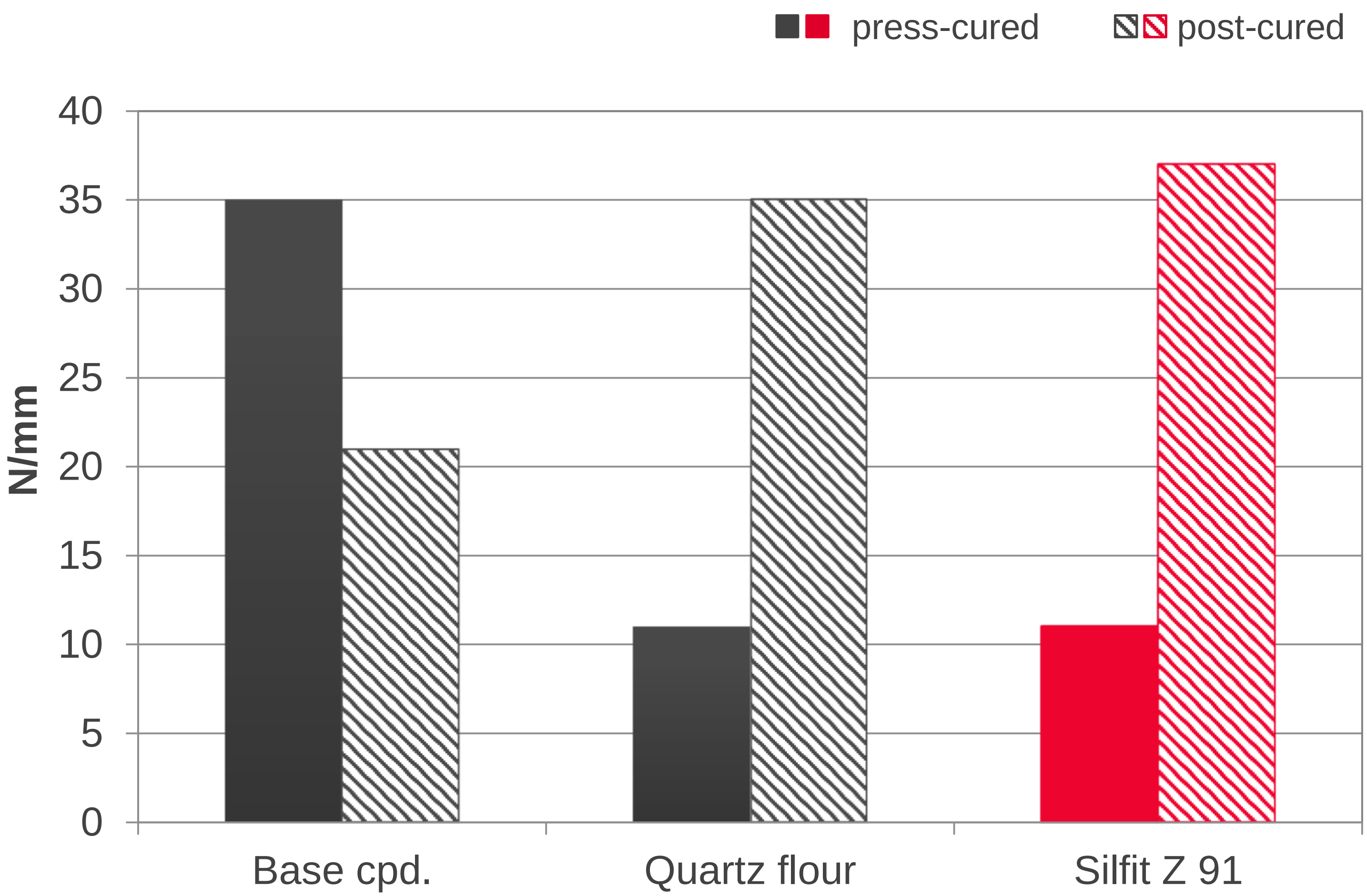
EXPERIMENTAL

RESULTS

Moldings

SUMMARY

DIN ISO 34-1 Bb (angle test piece with a nick)



Compression Set

24 h / 175 °C

INTRODUCTION

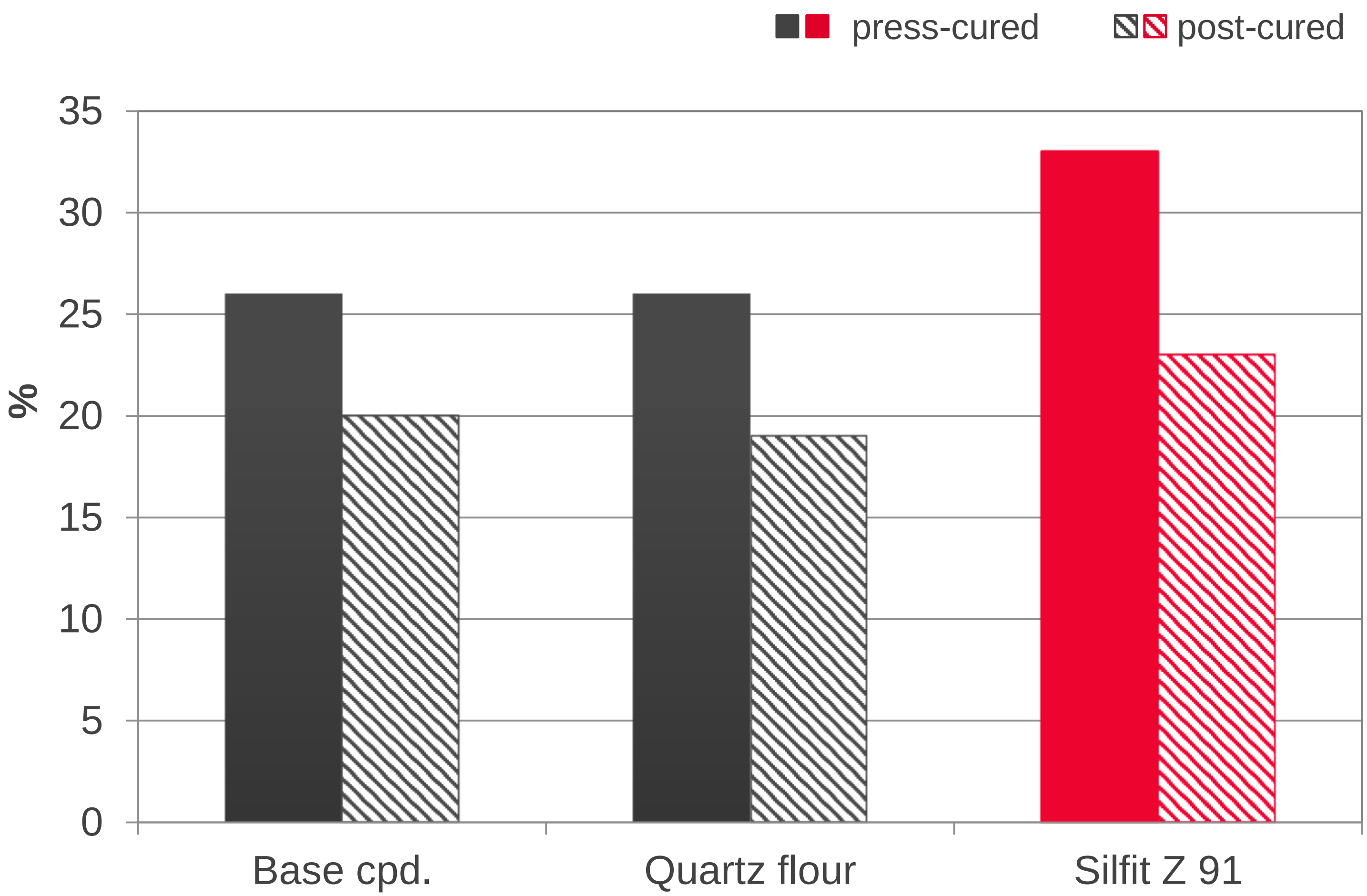
EXPERIMENTAL

RESULTS

Moldings

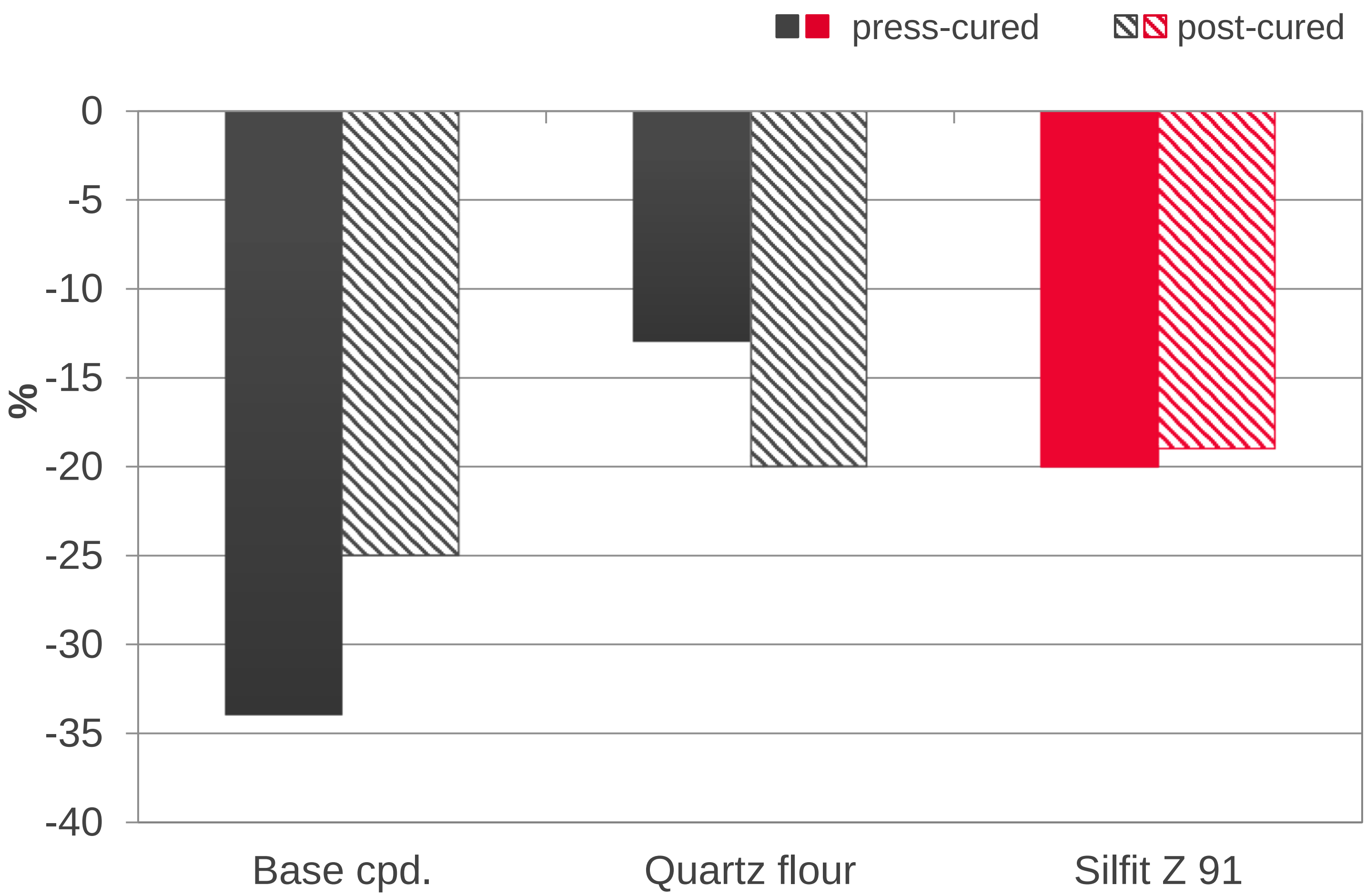
SUMMARY

DIN ISO 815-1 B, cooling method A, 25 % defl.



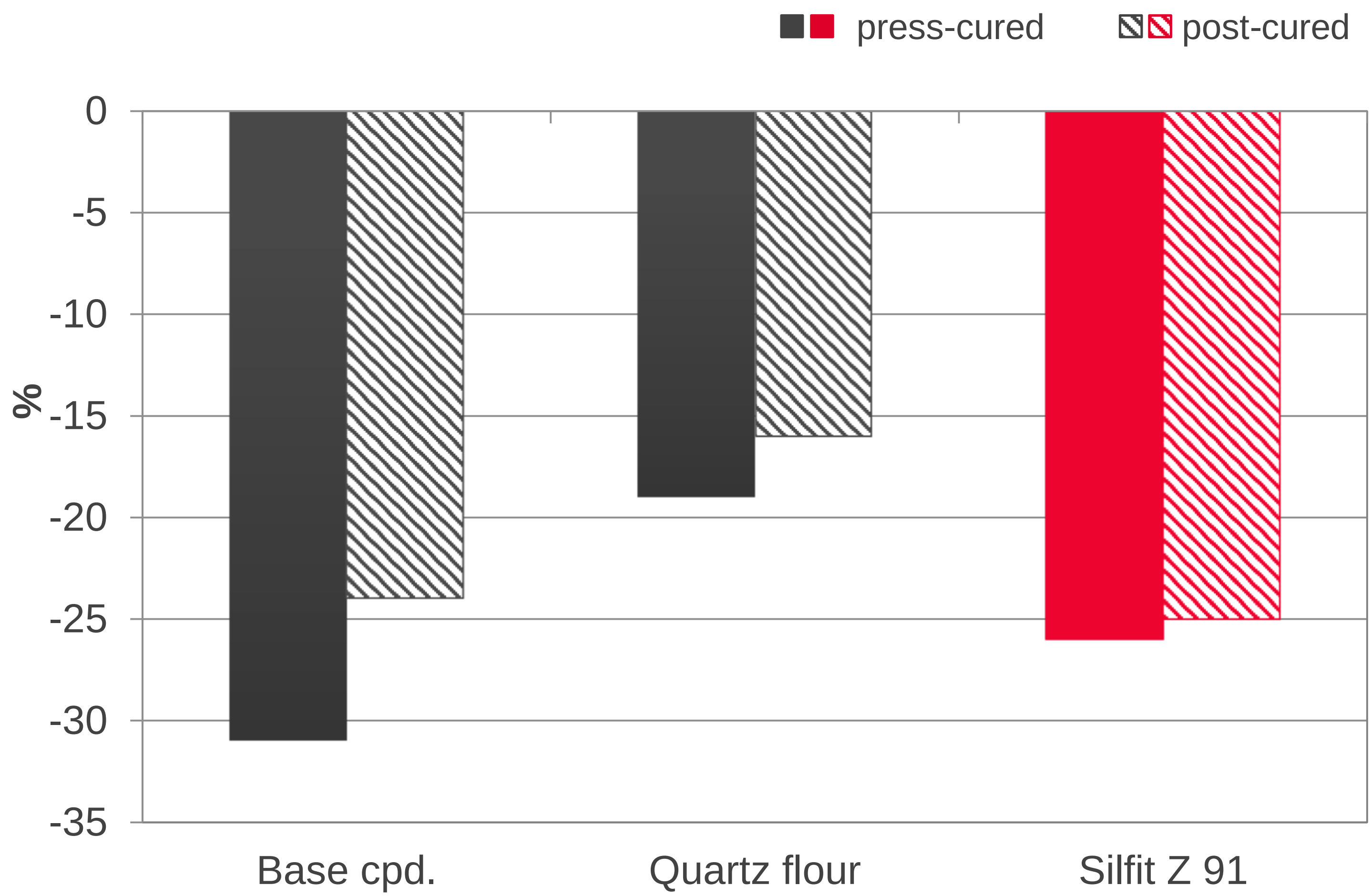
Hot Air Aging
Change of Tensile Strength

DIN 53 508, 168 h / 200 °C



Hot Air Aging
Change of Elongation at B.

DIN 53 508, 168 h / 200 °C



Immersion in IRM 903

Change of Elongation at B.

INTRODUCTION

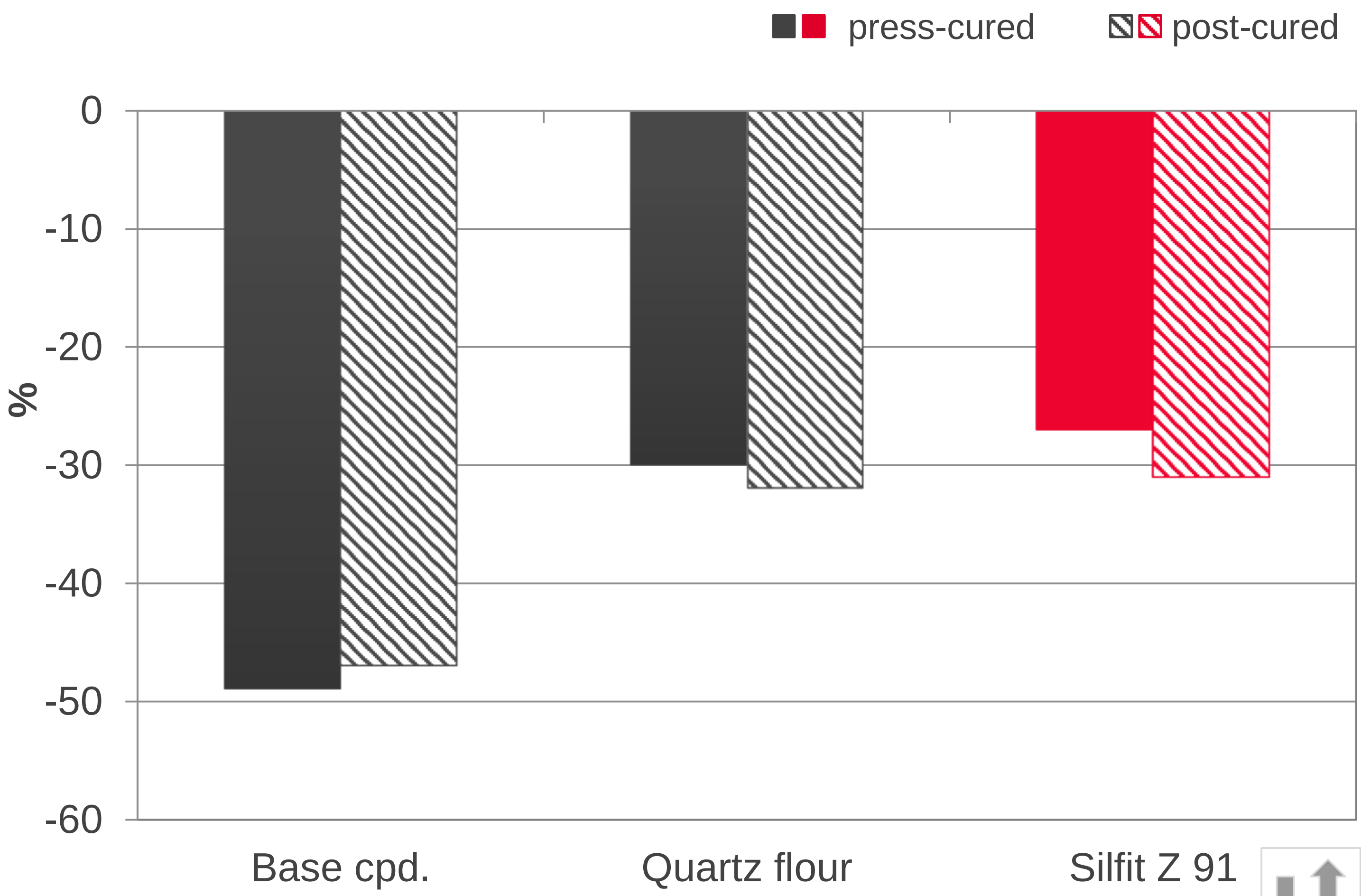
EXPERIMENTAL

RESULTS

Moldings

SUMMARY

DIN ISO 1817, 72 h / 150 °C

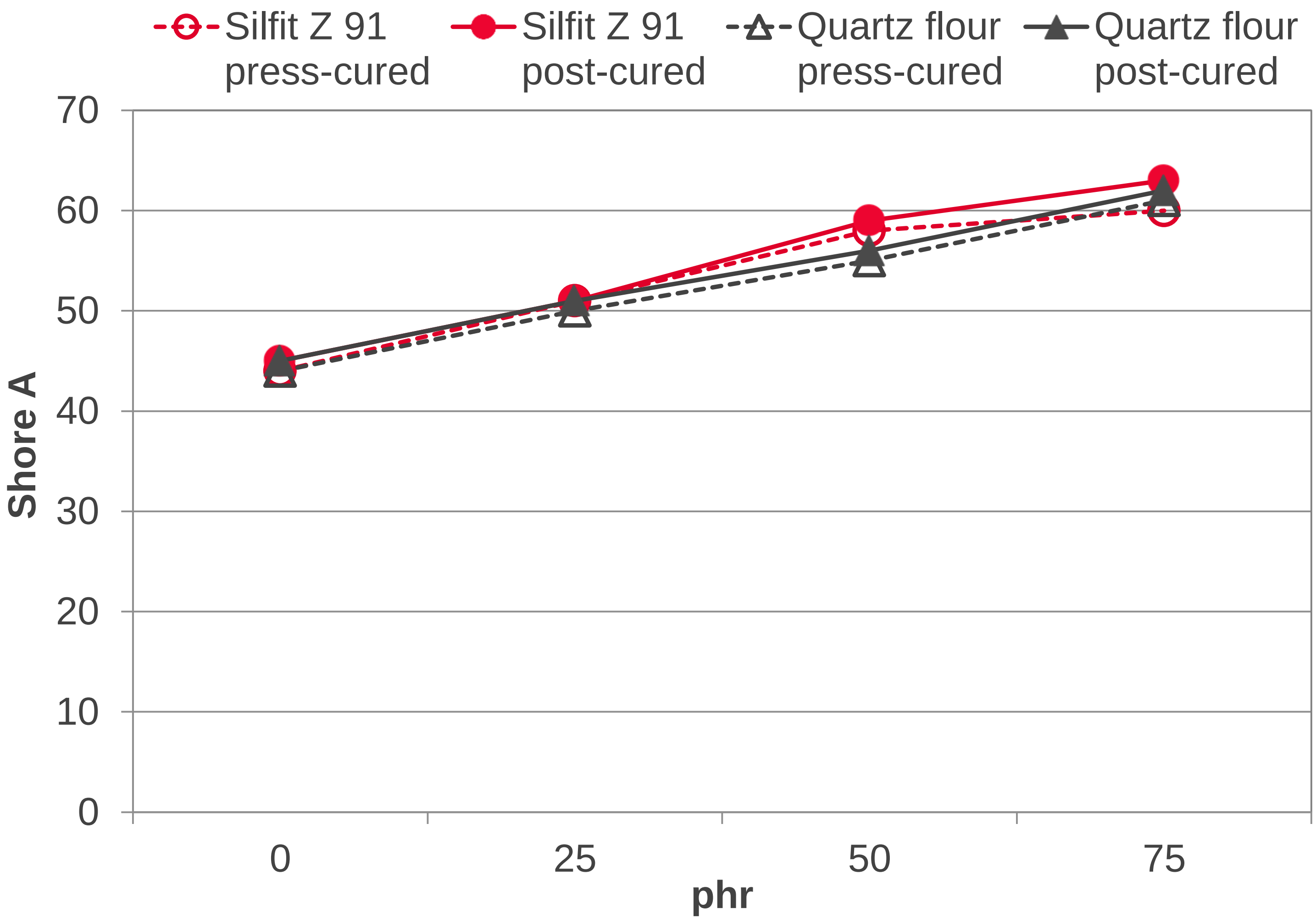


Formulation - Extrusion
Curing Agent E

in phr	Base cpd.	Quartz flour			Silfit Z 91		
Quartz flour	-	25	50	75	-	-	-
Silfit Z 91	-	-	-	-	25	50	75
Curing Agent E	1.5						
Elastosil R 401/40	100						

Hardness

DIN 53 505-A, piled-up S2-dumbbells



Tensile Strength

DIN 53 504, S2

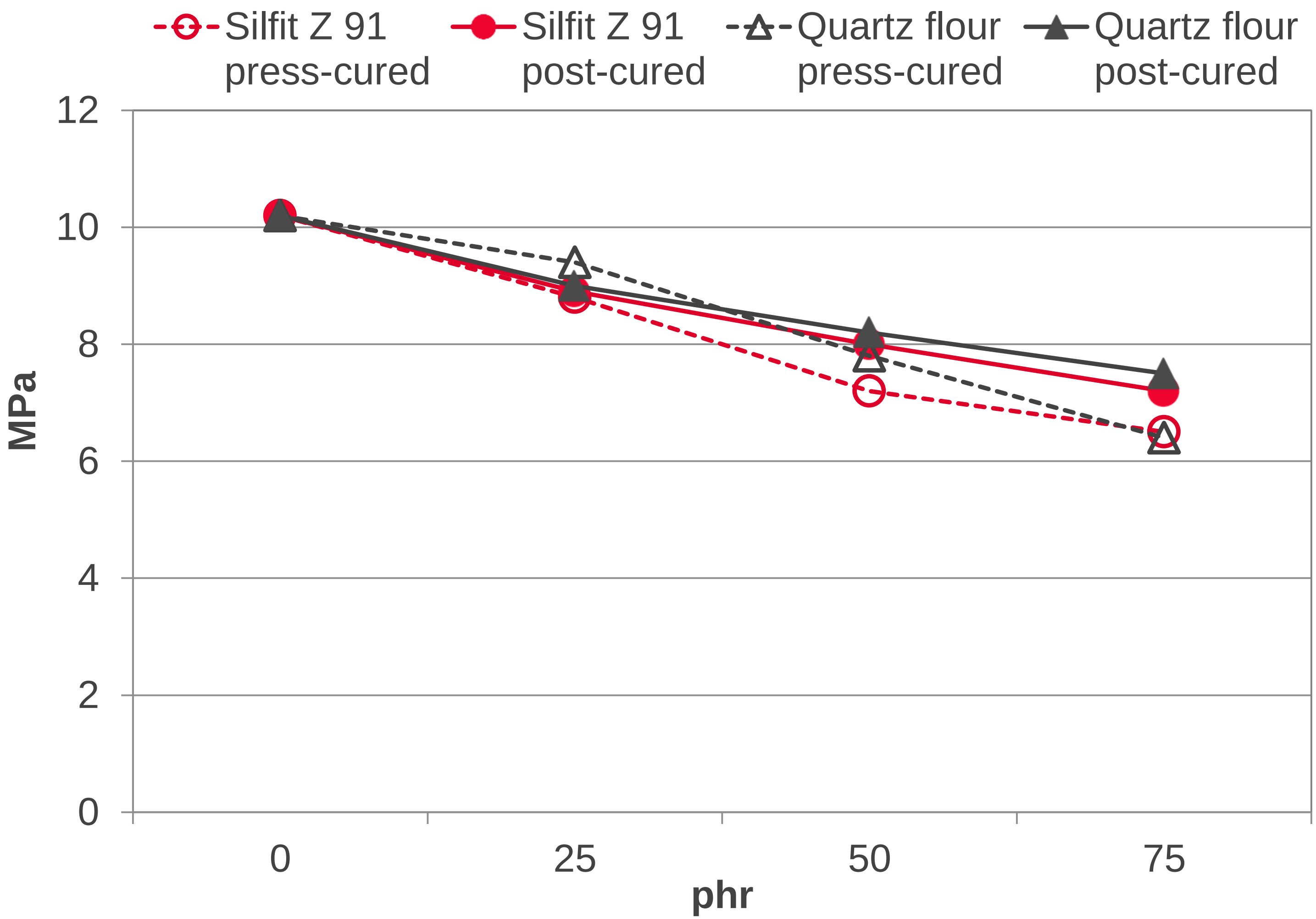
INTRODUCTION

EXPERIMENTAL

RESULTS

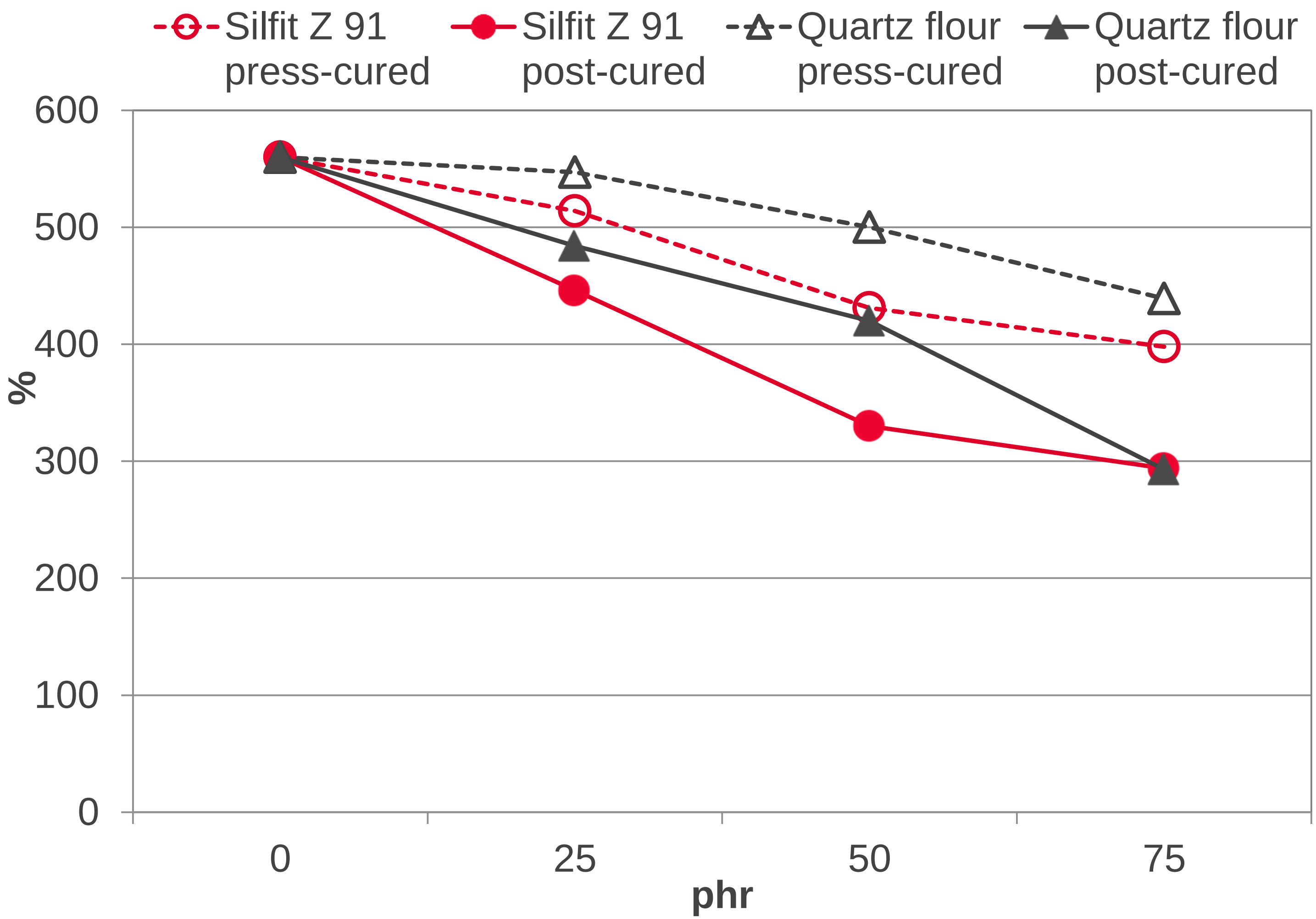
Extrusion

SUMMARY



Elongation at Break

DIN 53 504, S2



Tear Resistance

DIN ISO 34-1 Bb (angle test piece with a nick)

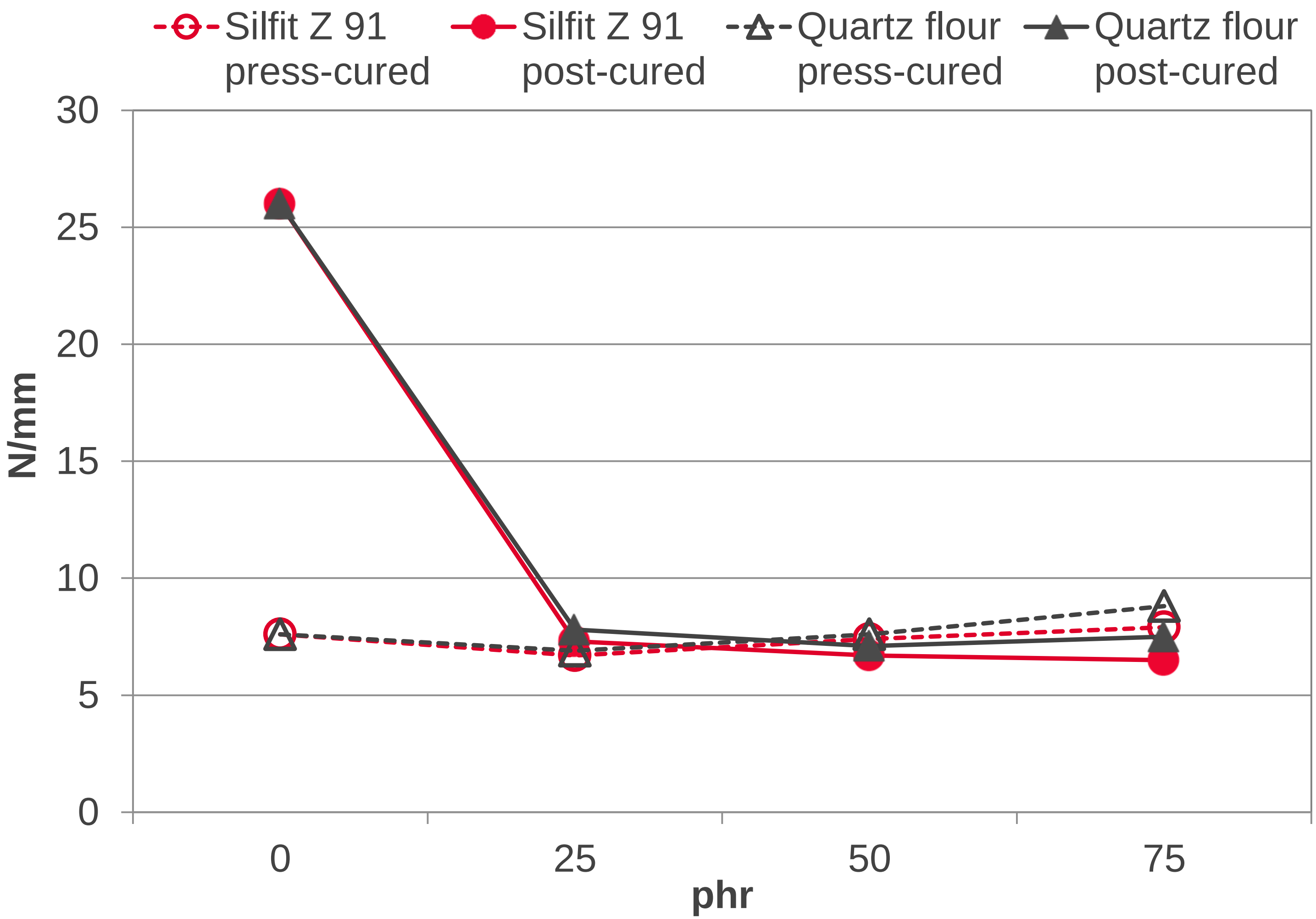
INTRODUCTION

EXPERIMENTAL

RESULTS

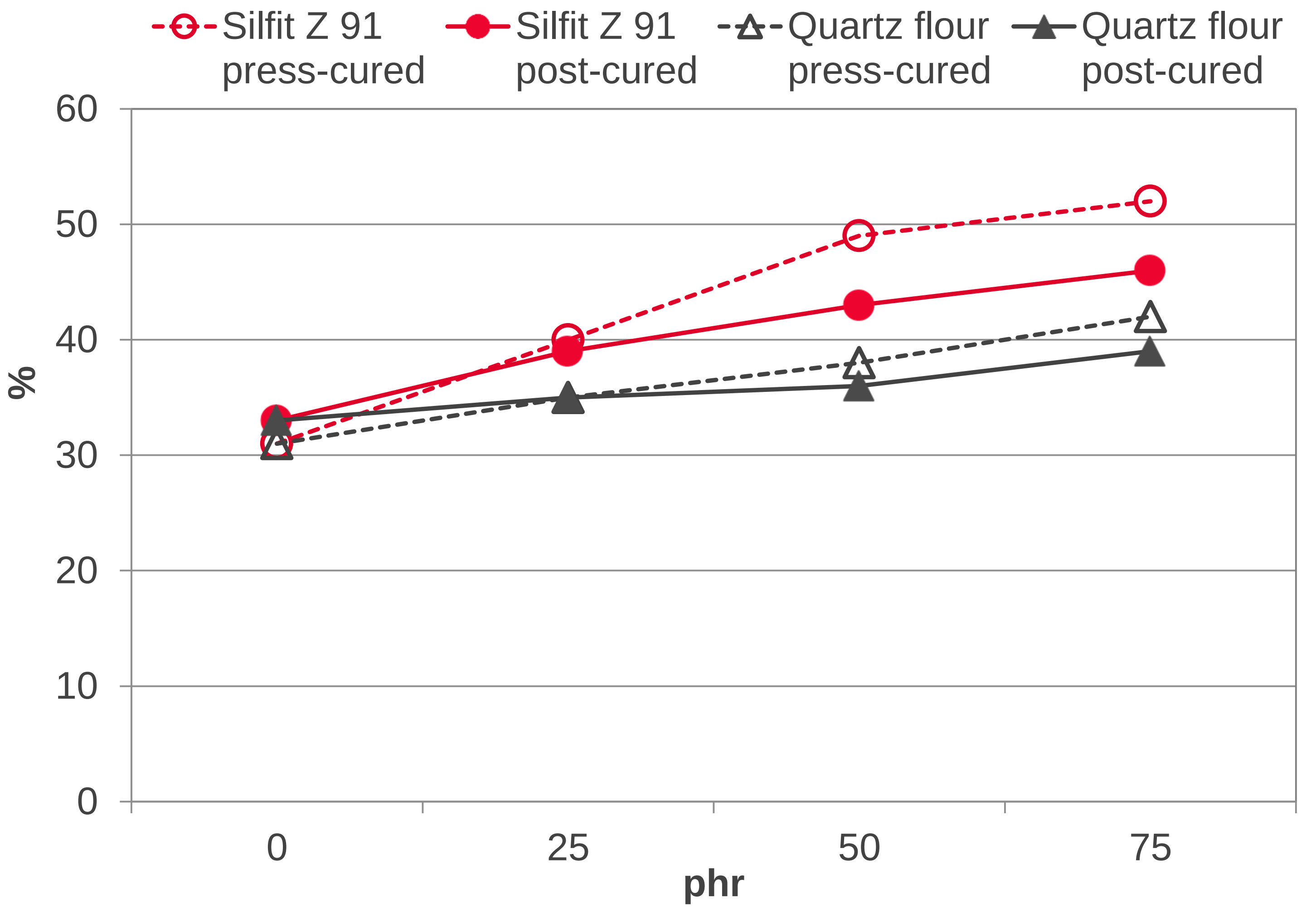
Extrusion

SUMMARY



Compression Set
24 h / 175 °C

DIN ISO 815-1 B, cooling method A, 25 % defl.



Hot Air Aging

Change of Elongation at B.

INTRODUCTION

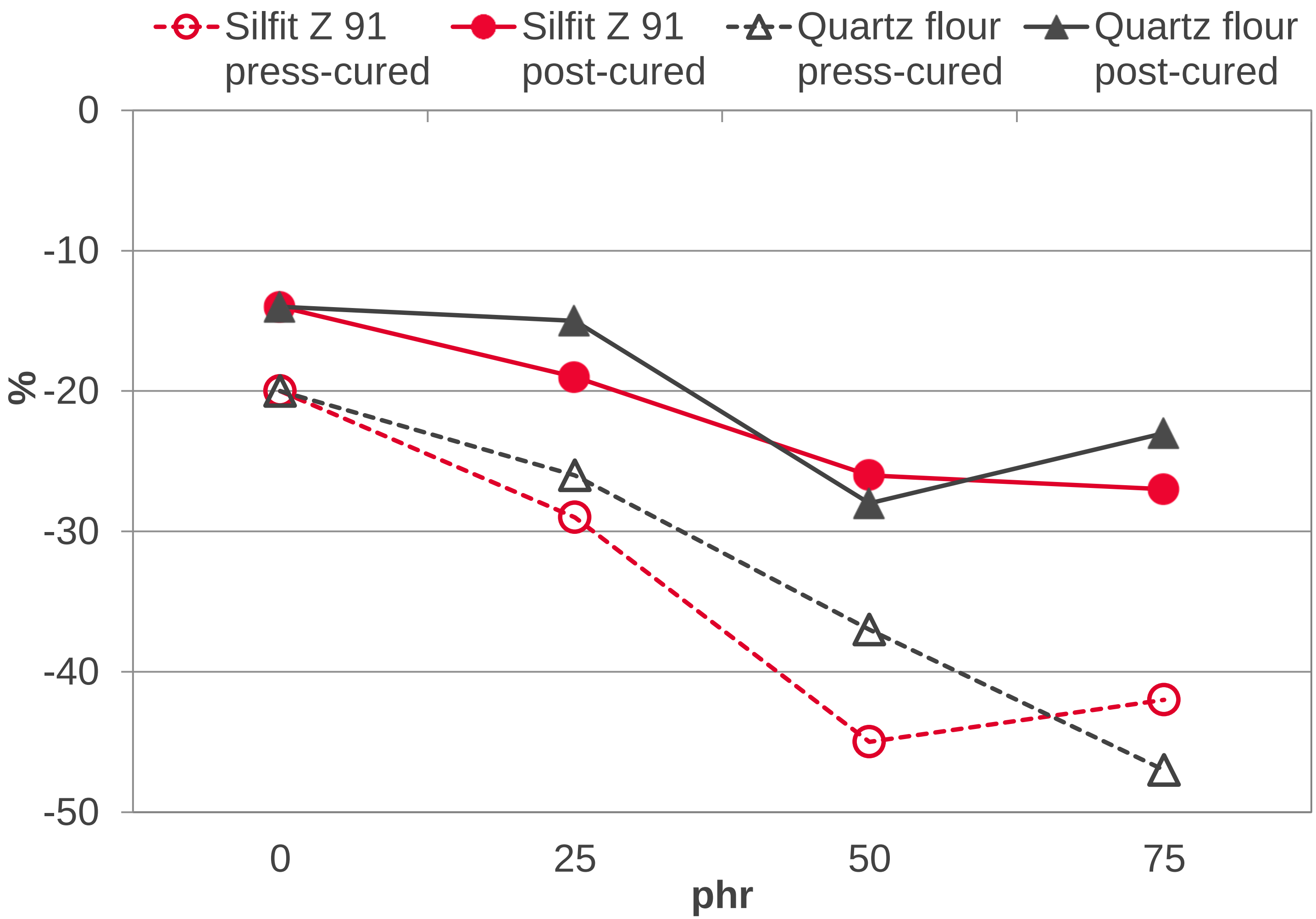
EXPERIMENTAL

RESULTS

Extrusion

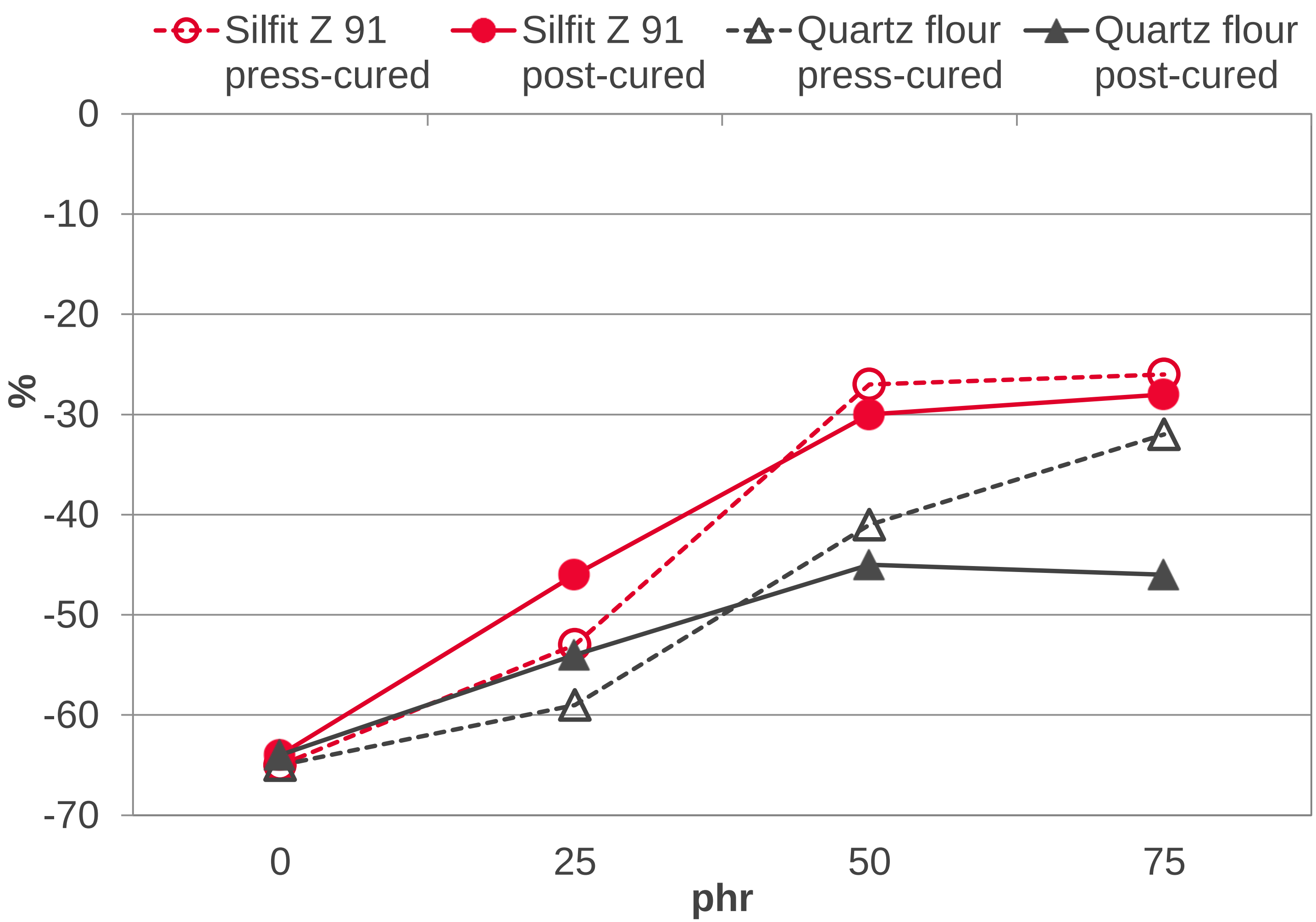
SUMMARY

DIN 53 508, 168 h / 200 °C



Immersion in IRM 903
Change of Tensile Strength

DIN ISO 1817, 72 h / 150 °C



Immersion in IRM 903
Change of Elongation at B.

INTRODUCTION

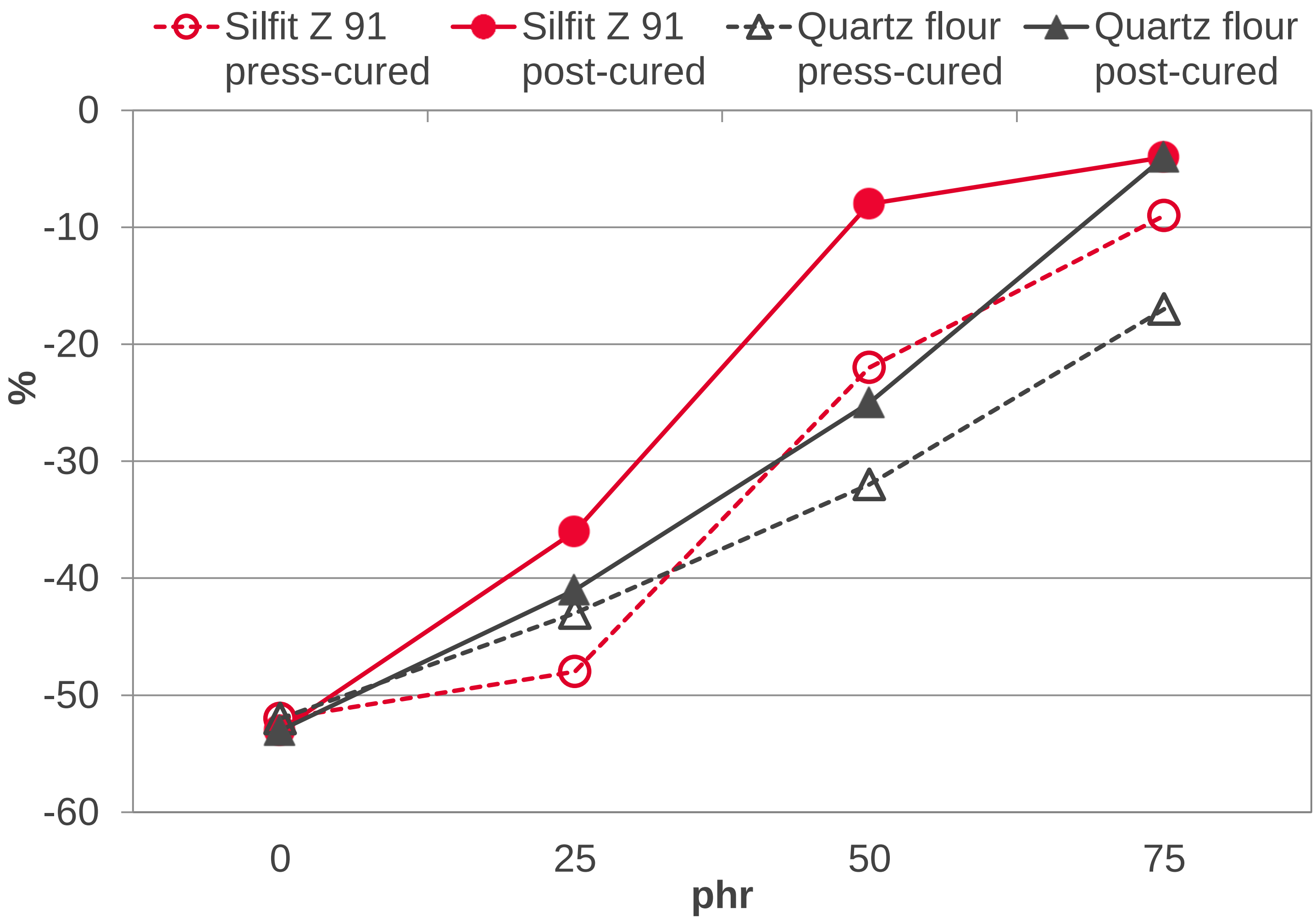
EXPERIMENTAL

RESULTS

Extrusion

SUMMARY

DIN ISO 1817, 72 h / 150 °C



Garvey Extrusion

Extruder		Schwabenthan Polytest 30 R
Screw diameter	[mm]	30
Process length	[mm]	450
Temperature set point head / zone 1 / zone 2	[°C]	25 / 25 / 25
Screw speed	[rpm]	adjustable
Garvey profile		see picture
Rating figure 1		die swell
Rating figure 2		30° edge
Rating figure 3		surface
Rating figure 4		corners
Objective of extrusion		output 10 m/min.

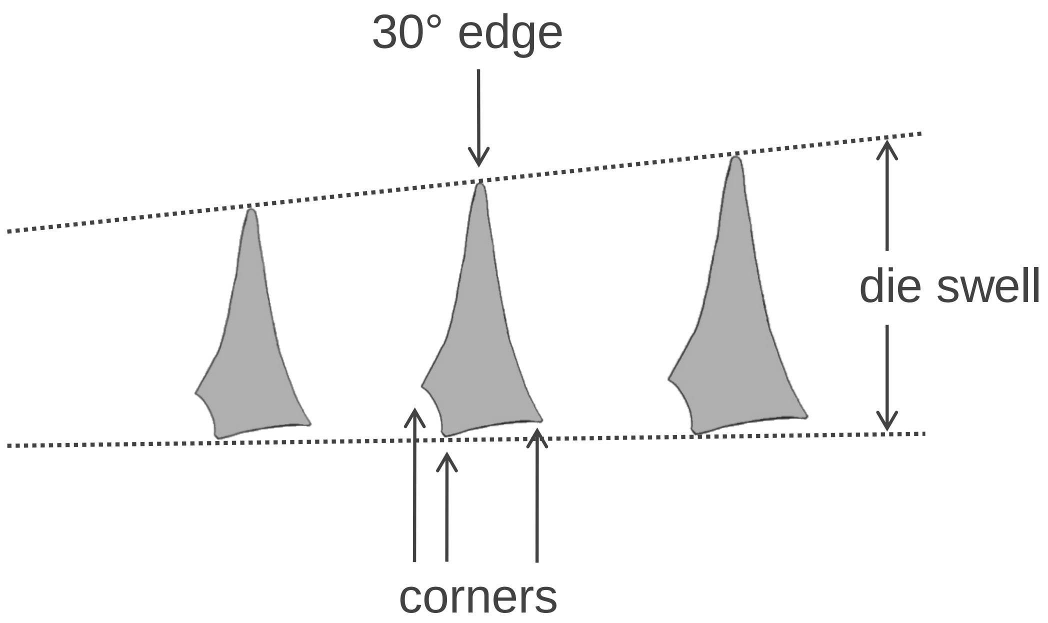
Garvey Extrusion

INTRODUCTION

EXPERIMENTAL

RESULTS

SUMMARY



Garvey Extrusion
Sum of Rating

INTRODUCTION

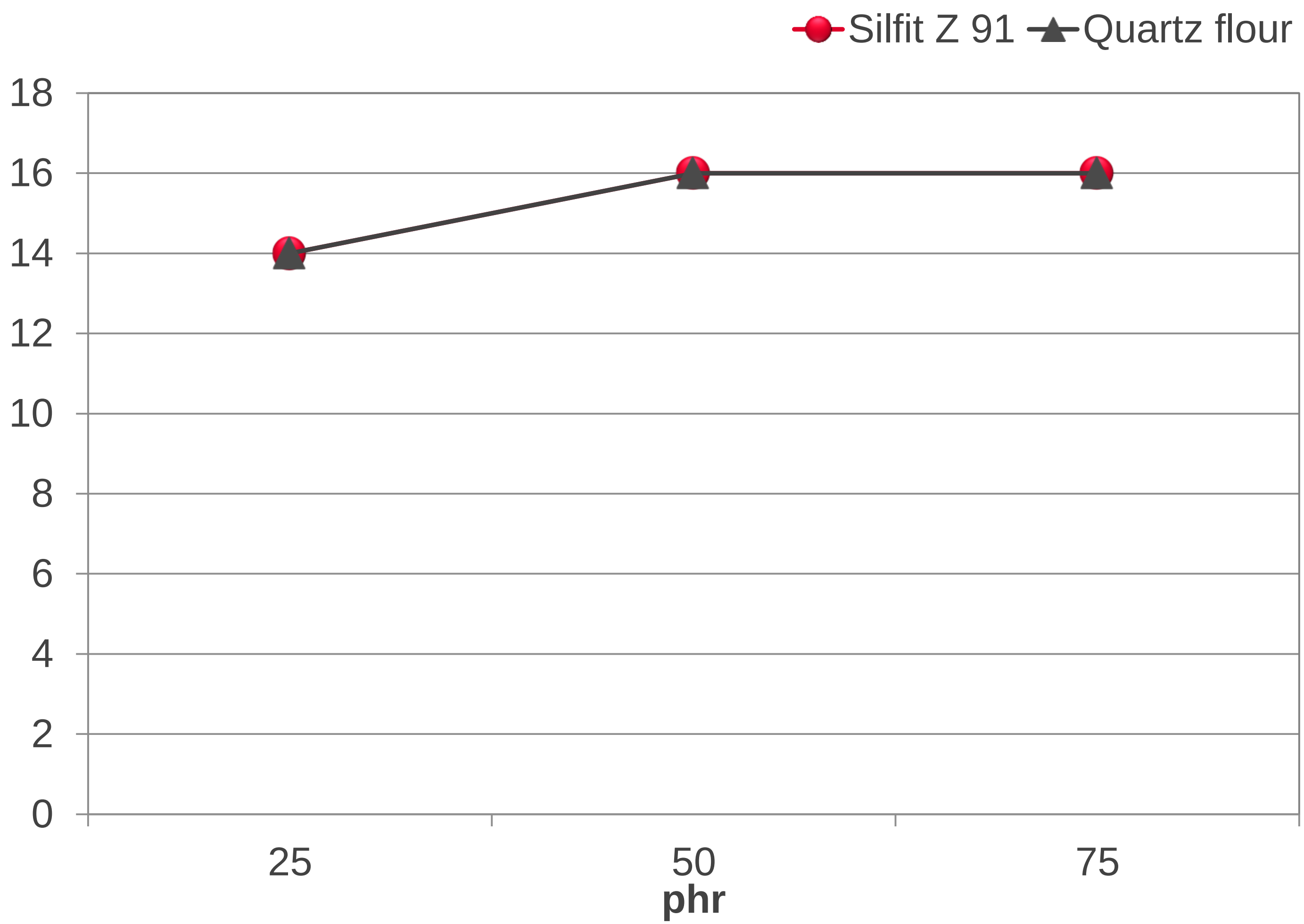
EXPERIMENTAL

RESULTS

Extrusion

SUMMARY

ASTM D 2230, output 10 m/min.

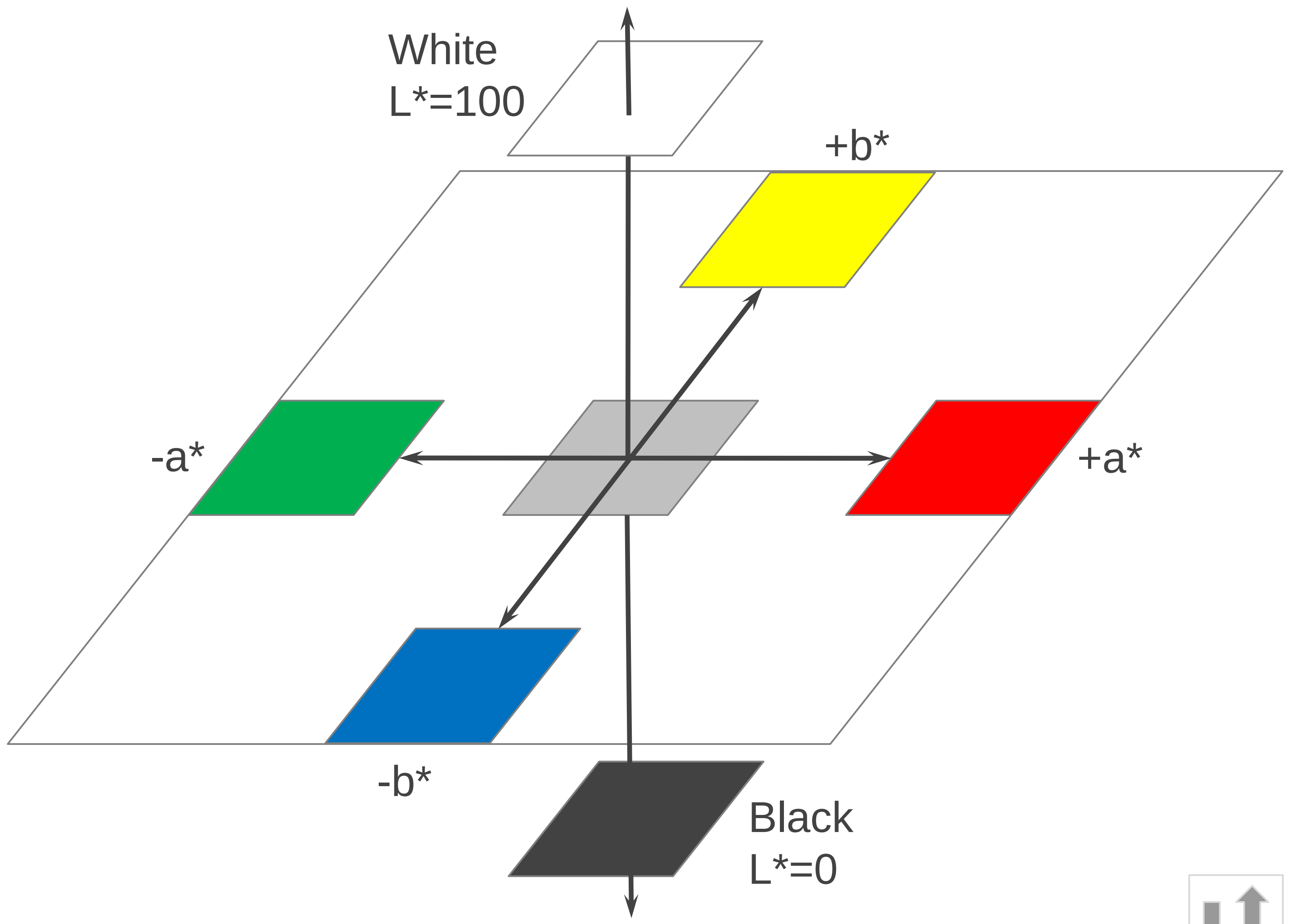


Blooming

after approx. 7 months, post-cured

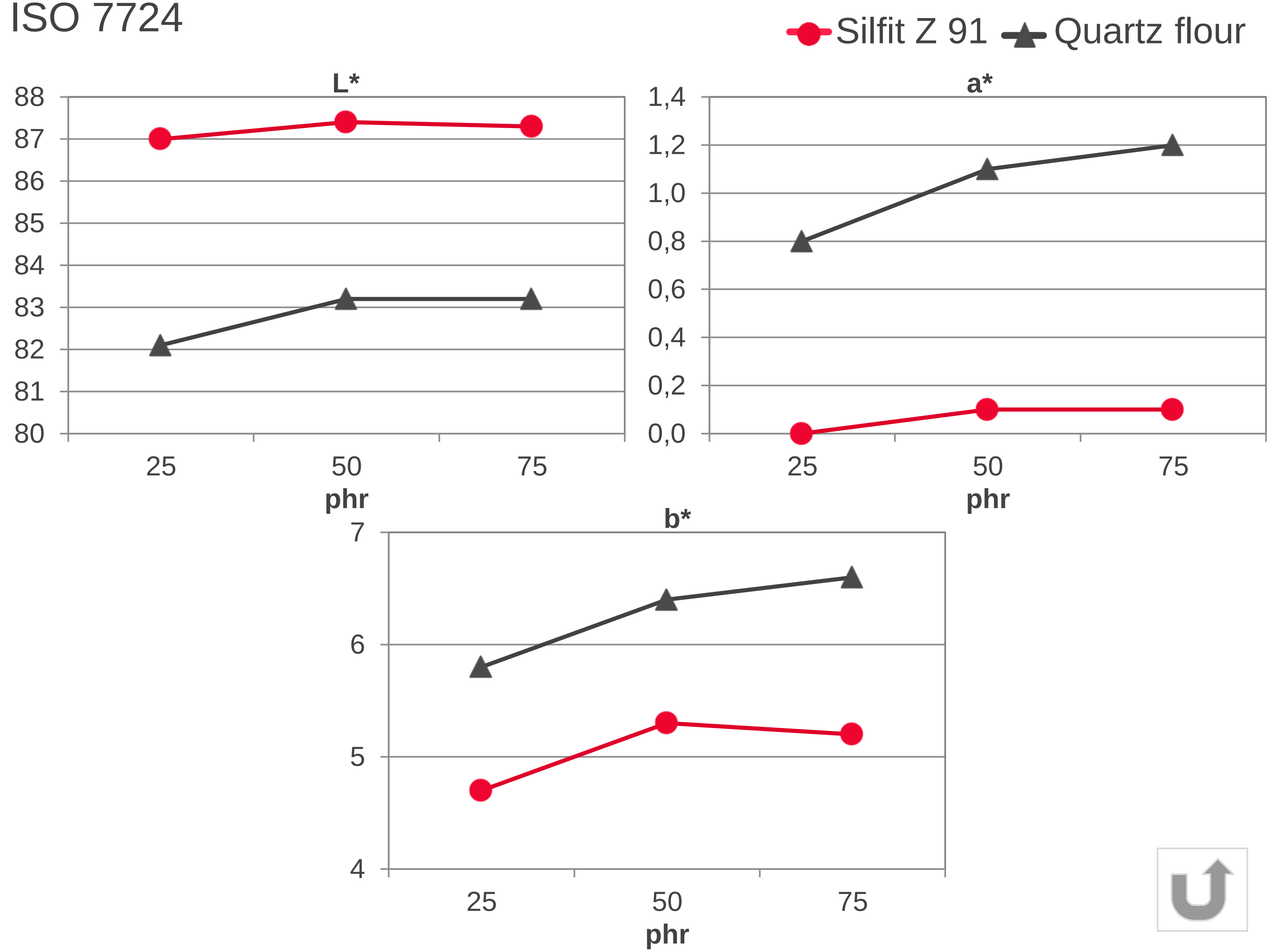
	0 phr	25 phr	50 phr	75 phr
Silfit Z 91				
Quartz flour				

CIE-LAB-System



Color

ISO 7724



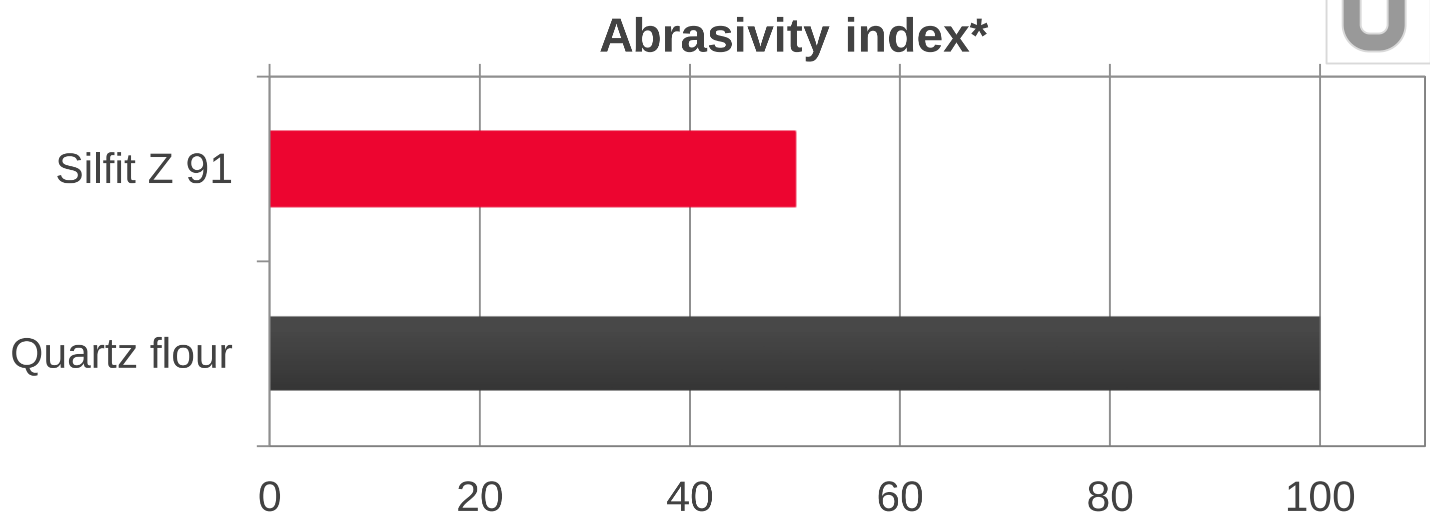
Processing and Worker Protection

INTRODUCTION

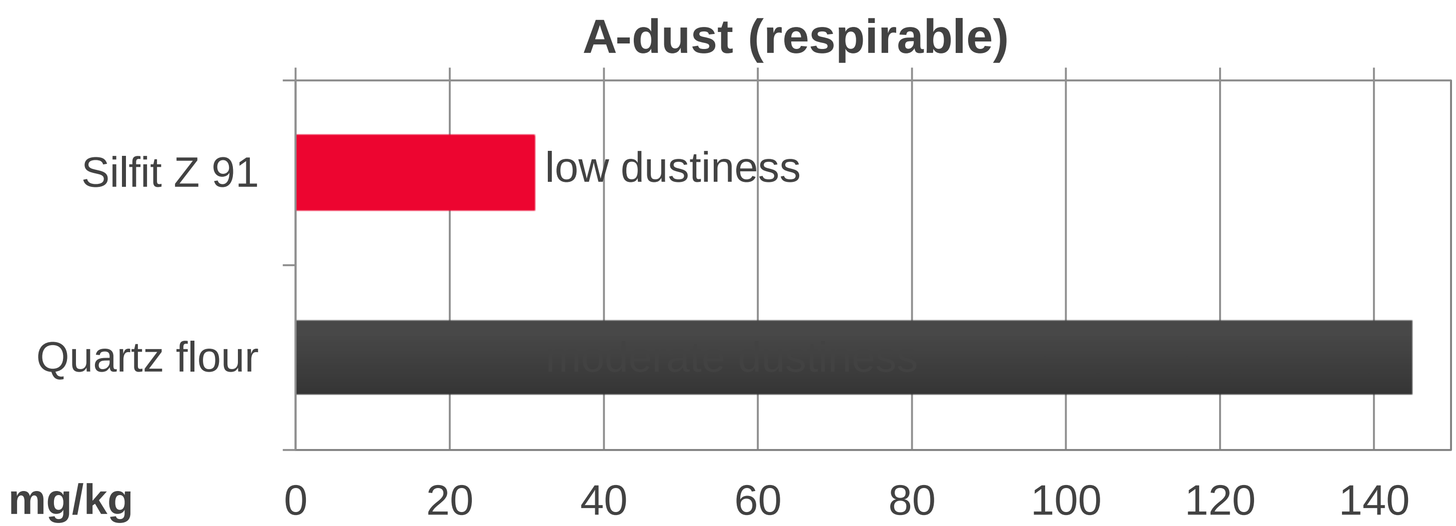
EXPERIMENTAL

RESULTS

SUMMARY



*based on Einlehner test



Conclusion

Silfit Z 91 is an **excellent alternative** for non-surface-treated quartz flour due to

- ✓ lower abrasivity
- ✓ less formation of dust
- ✓ higher color neutrality and brightness
- ✓ to a large extent comparable mechanical properties
- ✓ equal extrusion properties
- ✓ reduction resp. prevention of blooming (depending on filler loading)

Calcined Neuburg Siliceous Earth:

Material for good ideas

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