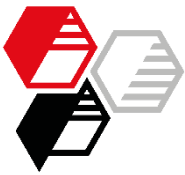




Neuburg Siliceous Earth in diaphragms for expansion vessels based on SBR DIN EN 13831

Author: Nicole Holzmayr



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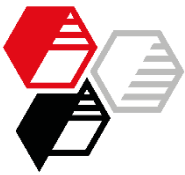
RESULTS

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DIN EN 13831

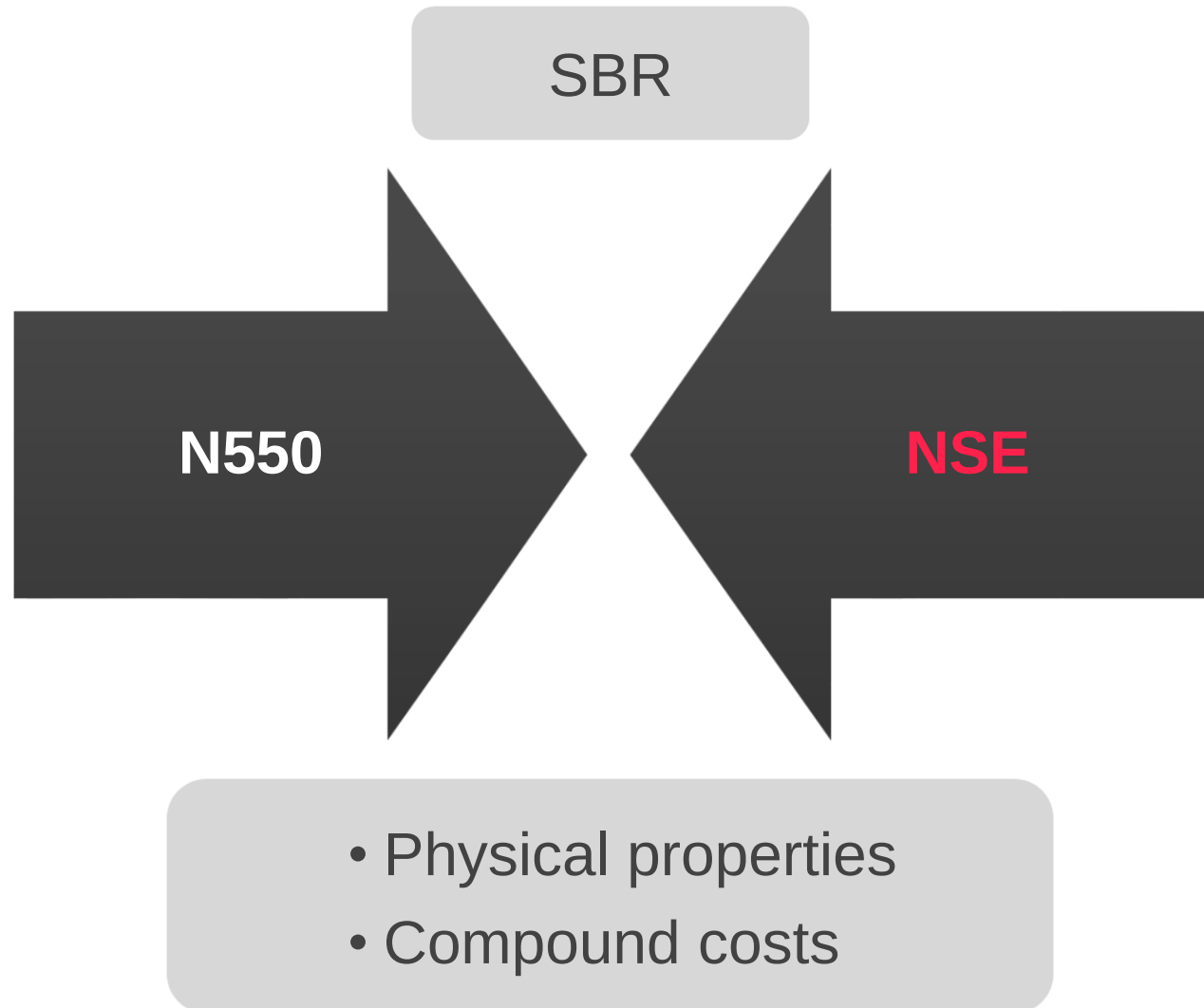
Closed expansion vessels with built in diaphragm for installation in water

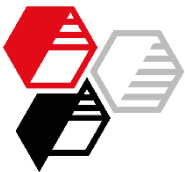
- application of elastic diaphragms for taking up additional water volume (e.g. after heating)
- possible use of different polymers:
IIR, NBR, NR, EPDM oder SBR
- typically used filler
Carbon Black N550



Objective

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Base Formulation

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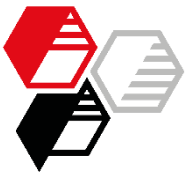
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Material	Description	phr
Buna SB 1502	SBR rubber Styrene: 23 %, ML 1+4 (100 °C): 50 MU	100
N550	Carbon Black FEF	90
Nytex 4700	naphtenic plasticizer	45
Dispergator FL	Process aid	1.4
Lipoxol 4000	Process aid, PEG	0.86
Zinkoxyd aktiv	Vulcanization activator	3
Stearic acid	Vulcanization activator / process aid	2
Vulkanox HS/LG	Antioxidant, TMQ	0.4
Vulkanox 4020/LG	Antioxidant, p-phenyldiamine	0.4
Sulfur	Vulcanizing agent	1.9
Rhenogran TMTD-70	Accelerator, TMTD, 70 %	1.5
Rhenogran MBTS-80	Accelerator, MBTS, 80 %	1.5
Total		247.96



Formulation Variations

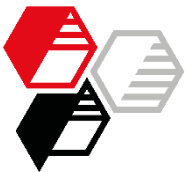
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in phr	N550	-N550, +Sillitin Z 86		
TMTD / MBTS	1.5 / 1.5	1.5 / 1.5	1.5 / 1.5 - PEG	2 / 1 - PEG
N550	90	60	60	60
Sillitin Z 86	-	60	60	60
Lipoxol 4000	0.86	0.86	-	-
Rhenogran TMTD-70	1.5	1.5	1.5	2
Rhenogran MBTS-80	1.5	1.5	1.5	1
Total	247.96	277.96	277.10	277.10



Neuburg Siliceous Earth

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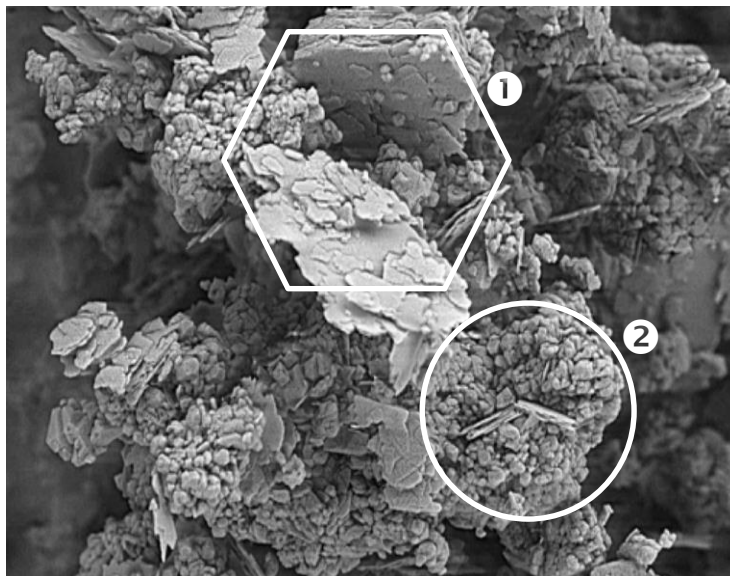
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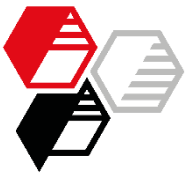
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	Particle size		Oil absorption [g/100g]	Specific surface area BET [m ² /g]
	d ₅₀ [μm]	d ₉₇ [μm]		
Sillitin Z 86	1.9	9.0	55	12



- ① lamellar: kaolinite
- ② corpuscular: silica



Preparation and Curing of the Compound

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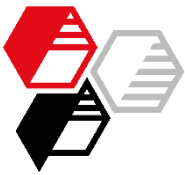
SUMMARY

Mixing

Open mill	Ø 150 x 300 mm
Batch amount	approx. 1 kg
Temperature	50 °C
Mixing time	approx. 20 min.

Curing

Laboratory conditions	5 minutes / 180 °C
realistic extreme conditions	1.5 minutes / 200 °C



Requirements

acc. to DIN EN 13831

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Mechanical properties

(8.5.2, Table 8, requirement of open diaphragms)

Hardness	Shore A	50 – 65
Tensile strength	MPa	10
Elongation at break	%	450
Compression set 70 h / 70 °C	%	≤ 40

After storage in dist. water, 28 d / 70 °C

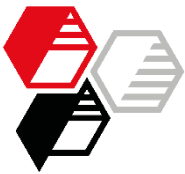
(8.5.2, Table 9, limits for aging tests)

Δ Hardness	Shore A	≤ 5
Δ Tensile strength	%	≤ 25
Δ Elongation at break	rel.%	≤ 25

After storage in dist. water, 28 d / 70 °C

from previous version, DIN 4807

Compression set	%	≤ 50
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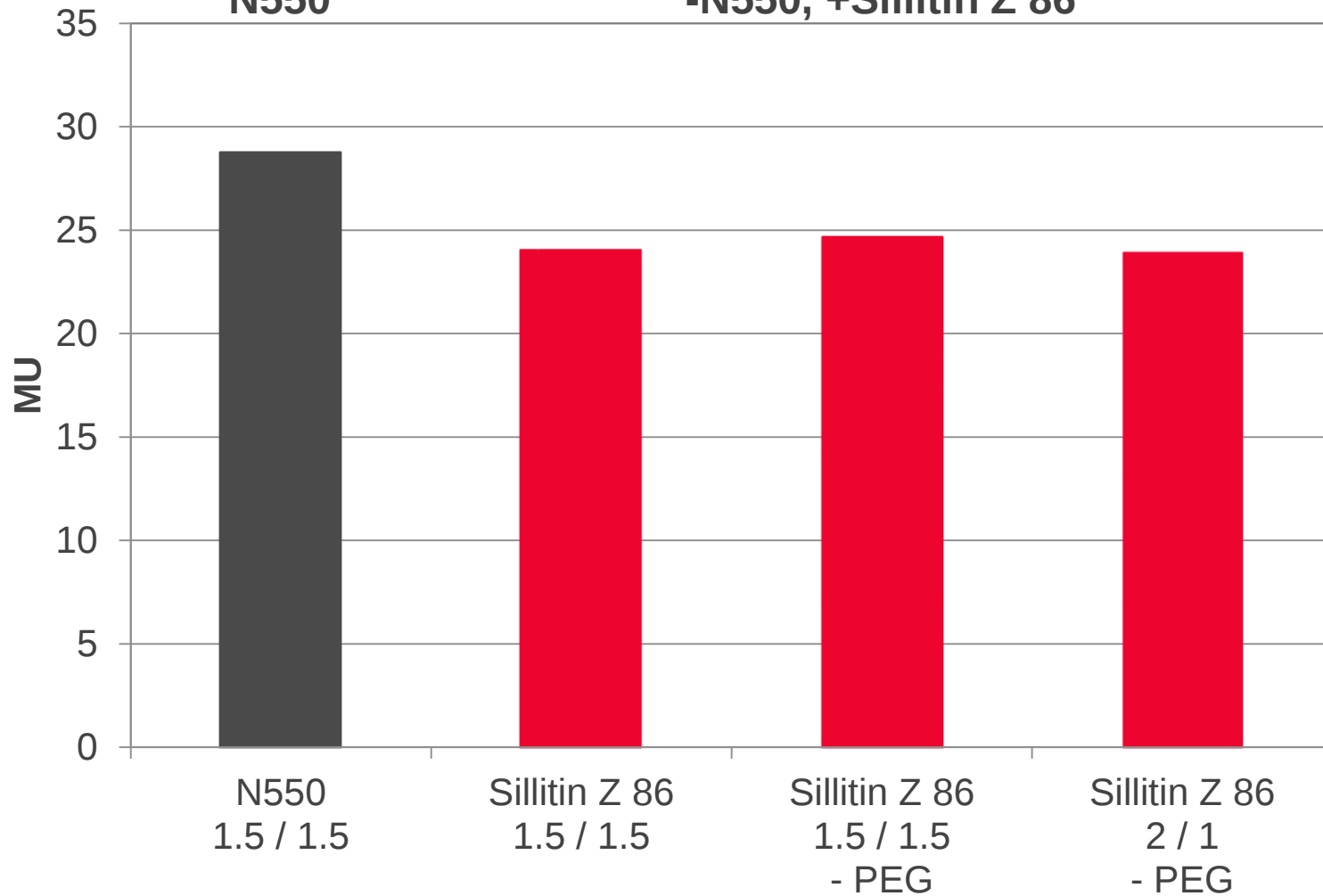


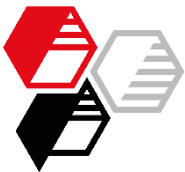
Mooney-Viscosity

DIN 53 523 Part 3, ML 1+4 120 °C

N550

-N550, +Sillitin Z 86



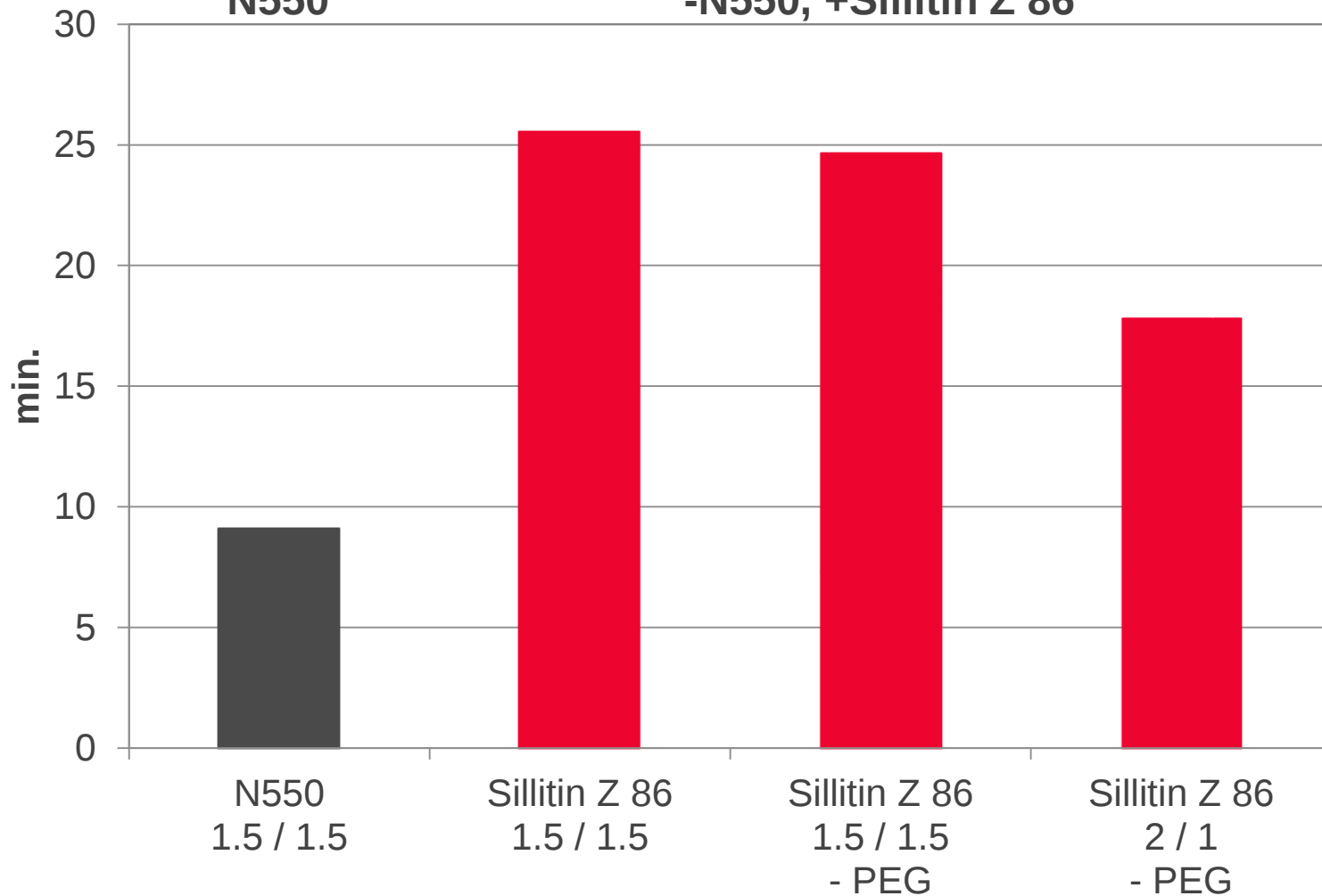


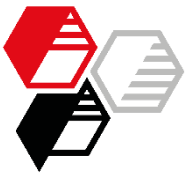
Mooney Scorch Time

DIN 53 523 Part 3, ML +5 120 °C

N550

-N550, +Sillitin Z 86



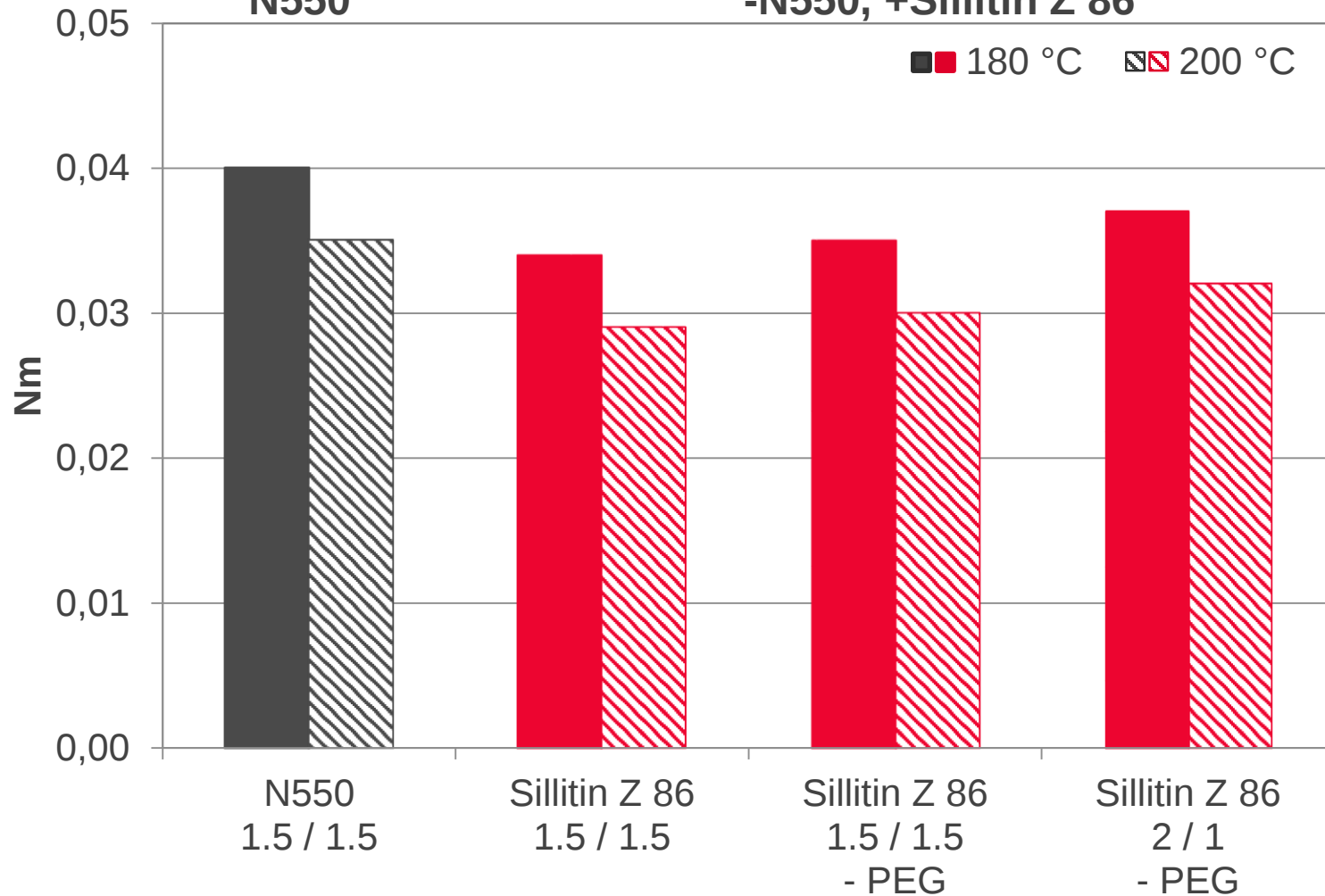


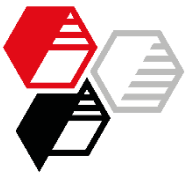
Torque Minimum

DIN 53 529-A3, 0.2° deflection – Göttfert Elastograph

N550

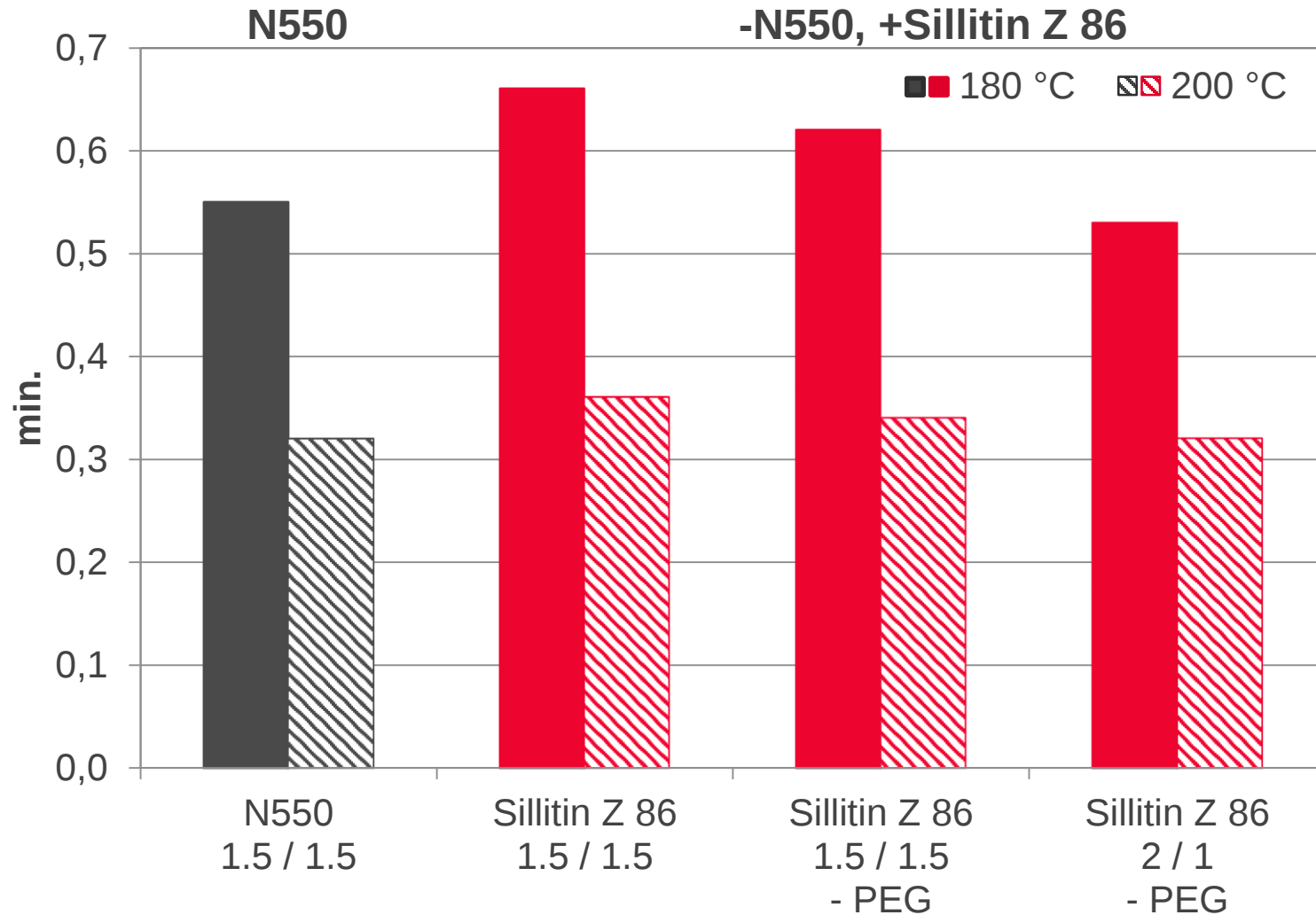
-N550, +Sillitin Z 86

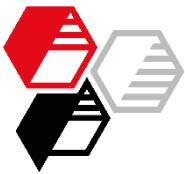




Conversion Time t_5

DIN 53 529-A3, 0.2° deflection – Göttfert Elastograph



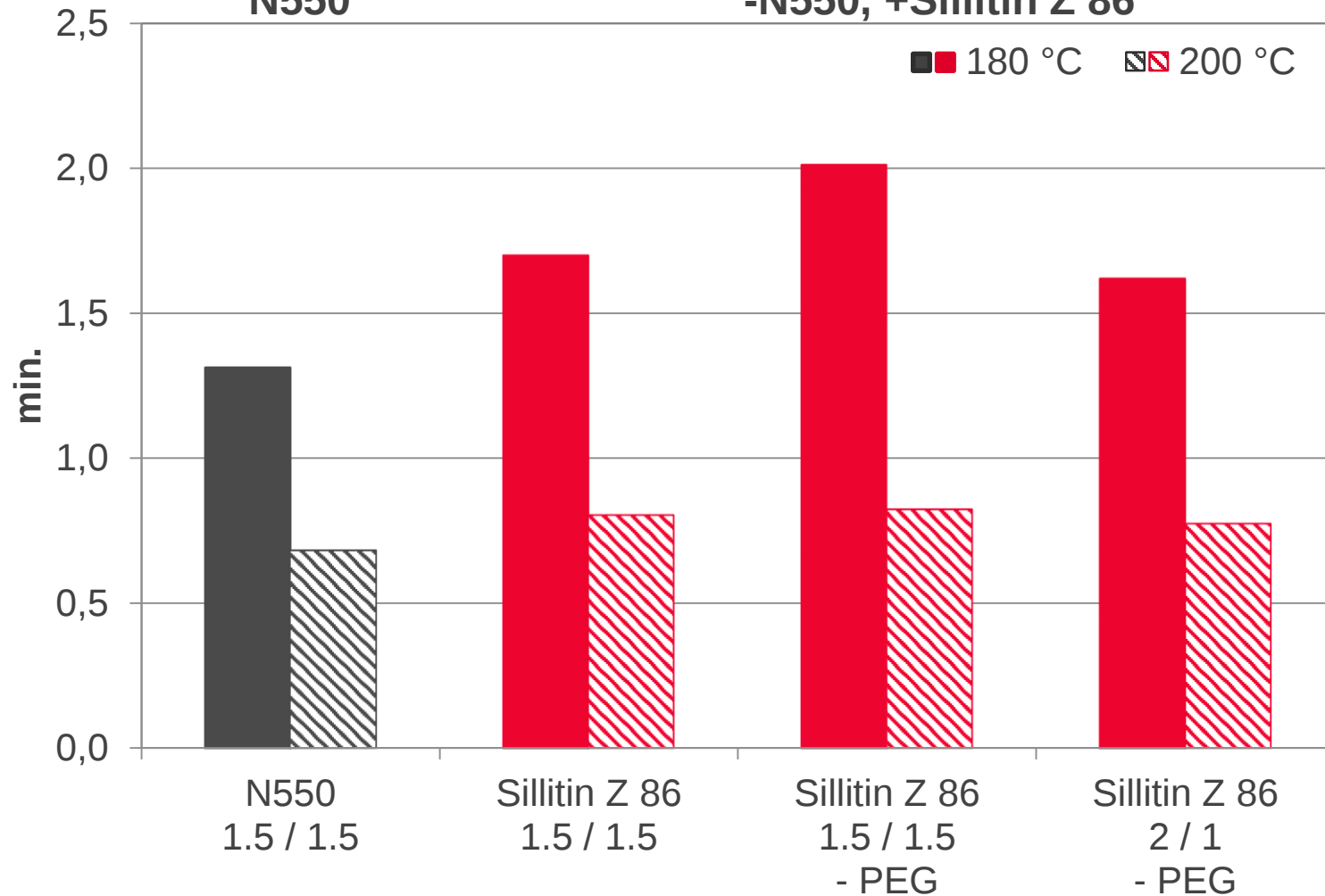


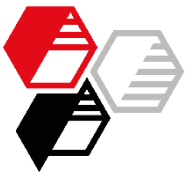
Conversion Time t_{90}

DIN 53 529-A3, 0.2° deflection – Göttfert Elastograph

N550

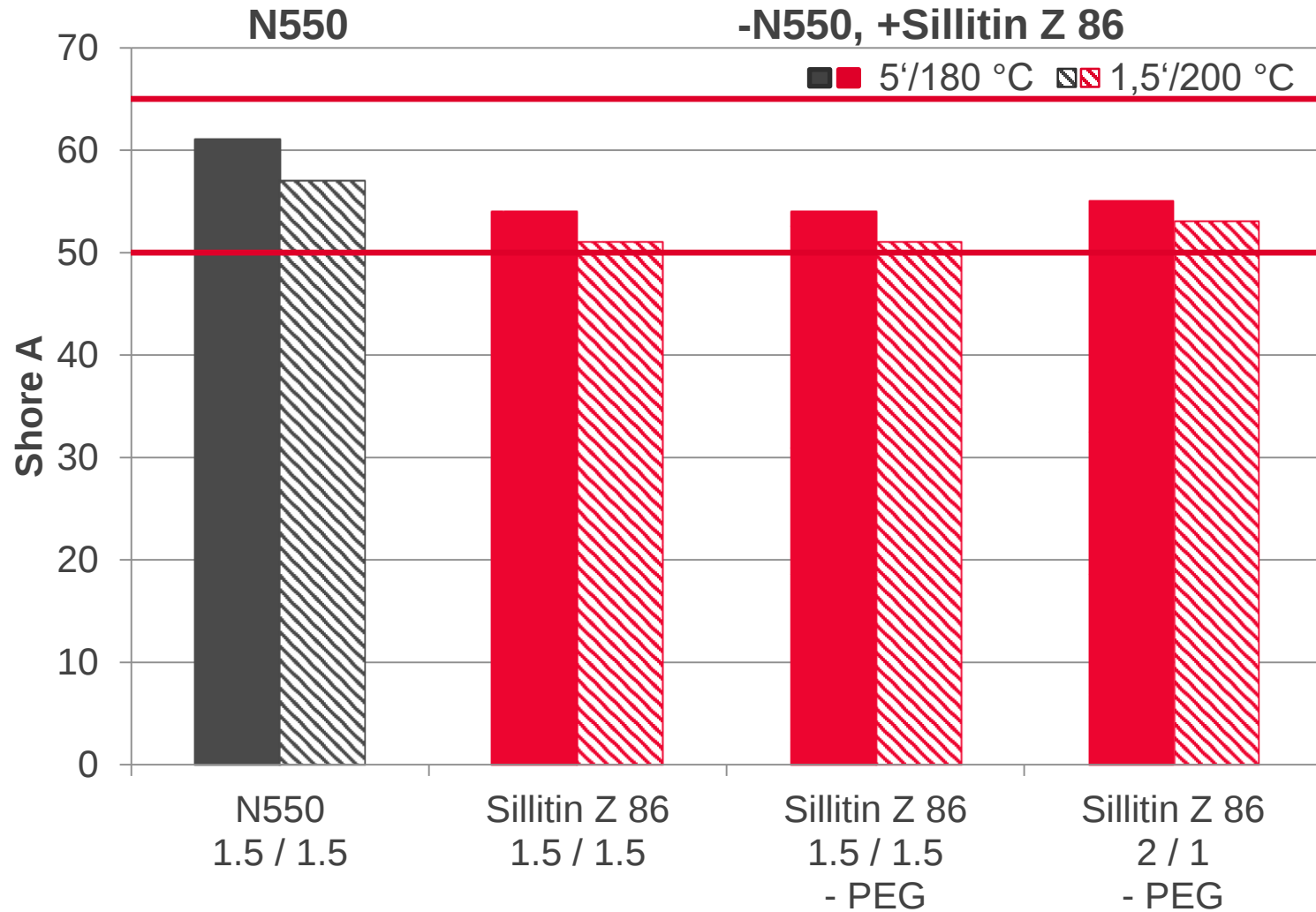
-N550, +Sillitin Z 86

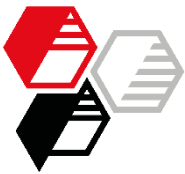




Hardness

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



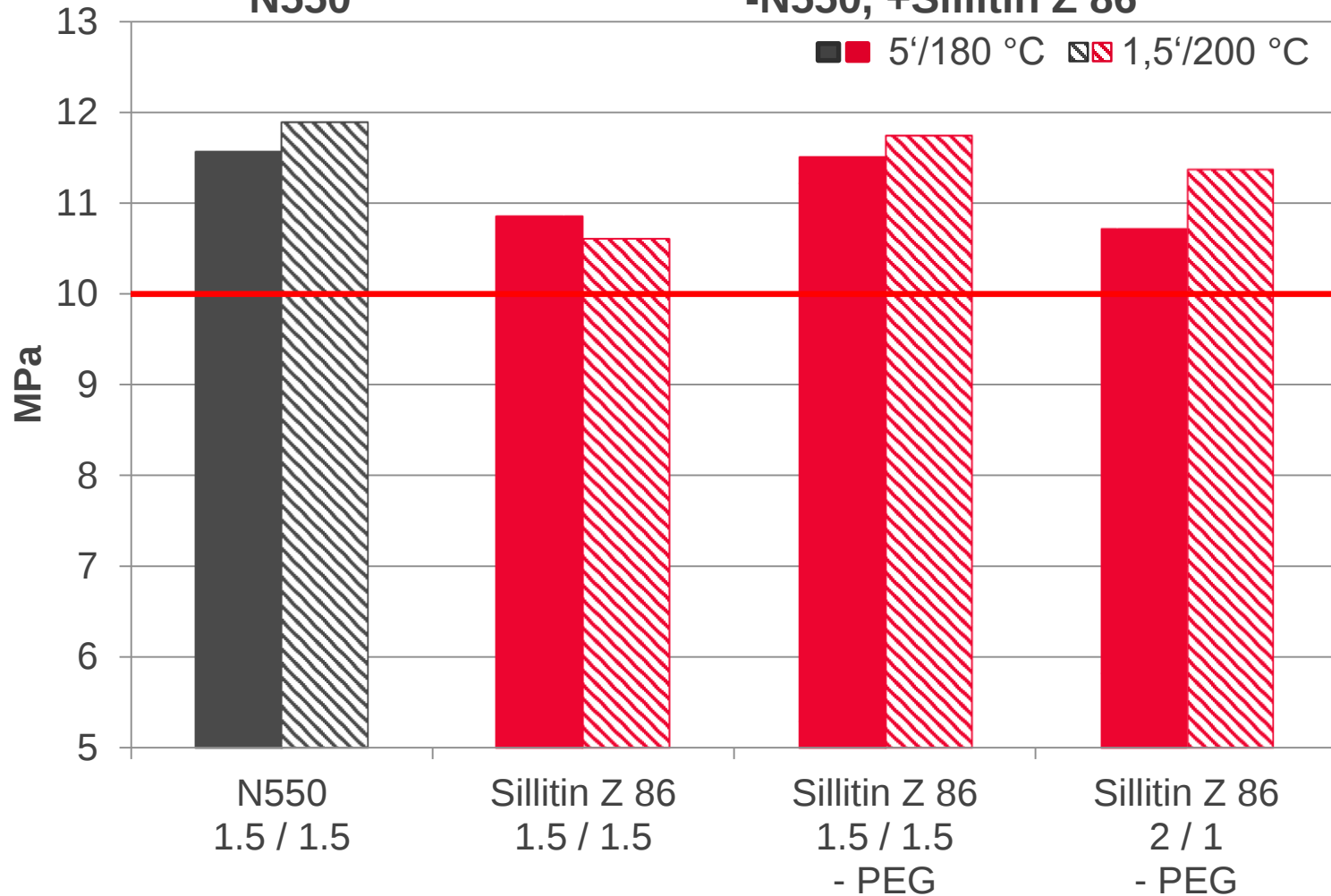


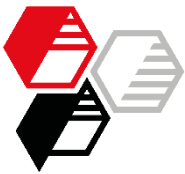
Tensile Strength

DIN 53 504, S2

N550

-N550, +Sillitin Z 86



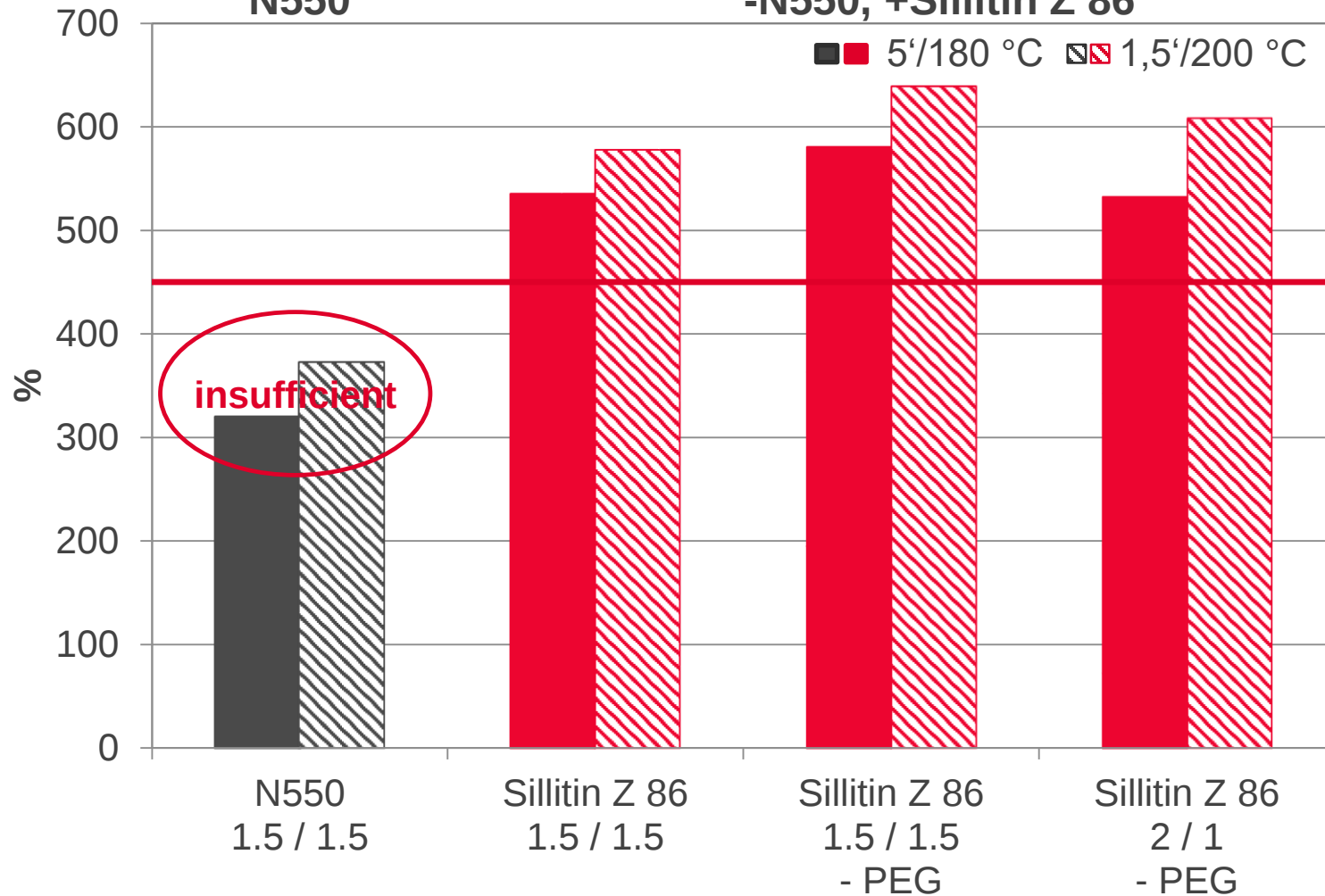


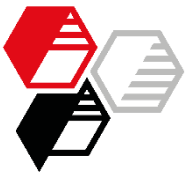
Elongation at Break

DIN 53 504, S2

N550

-N550, +Sillitin Z 86



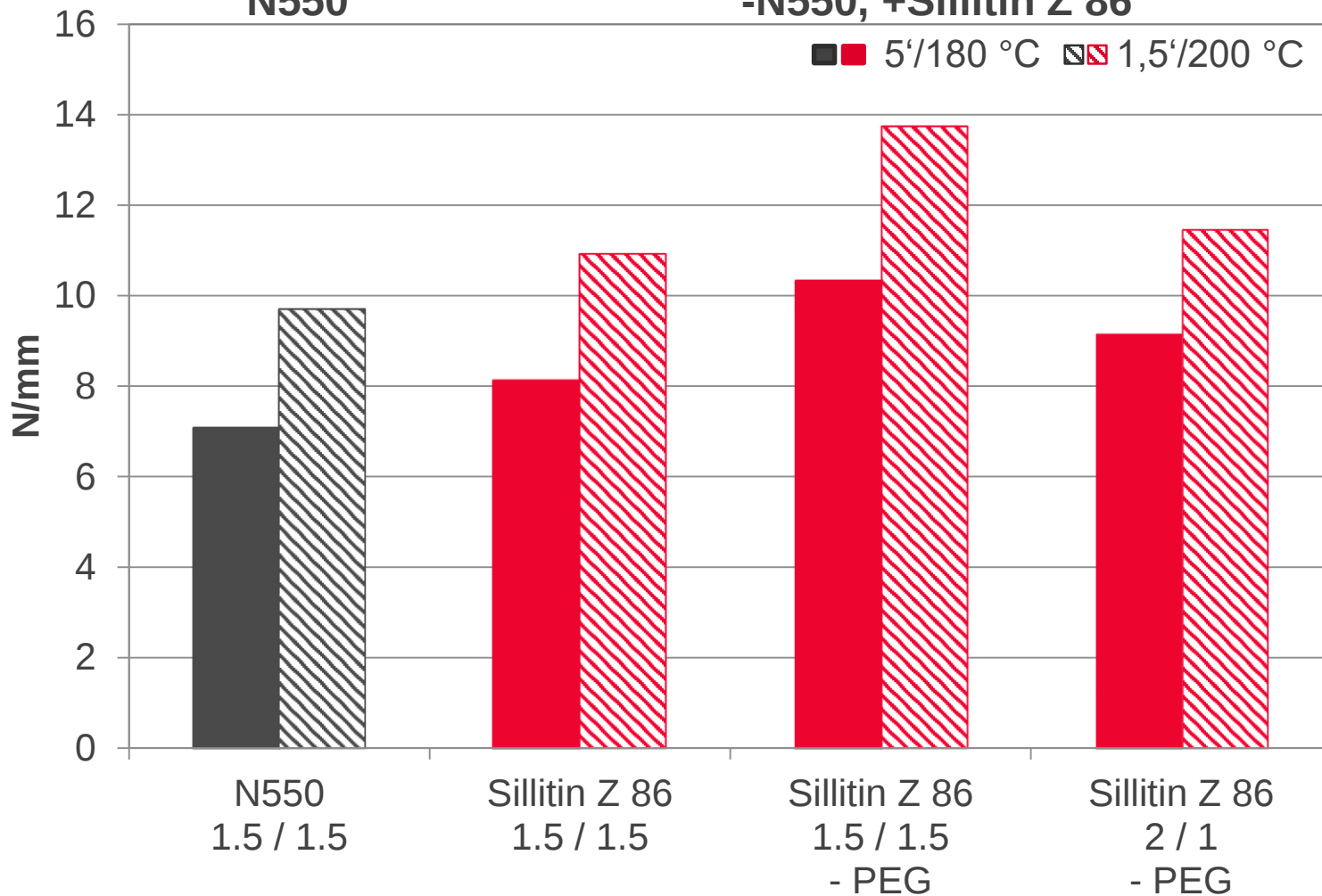


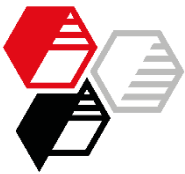
Tear Resistance

DIN ISO 34-1, Trouser Tear

N550

-N550, +Sillitin Z 86



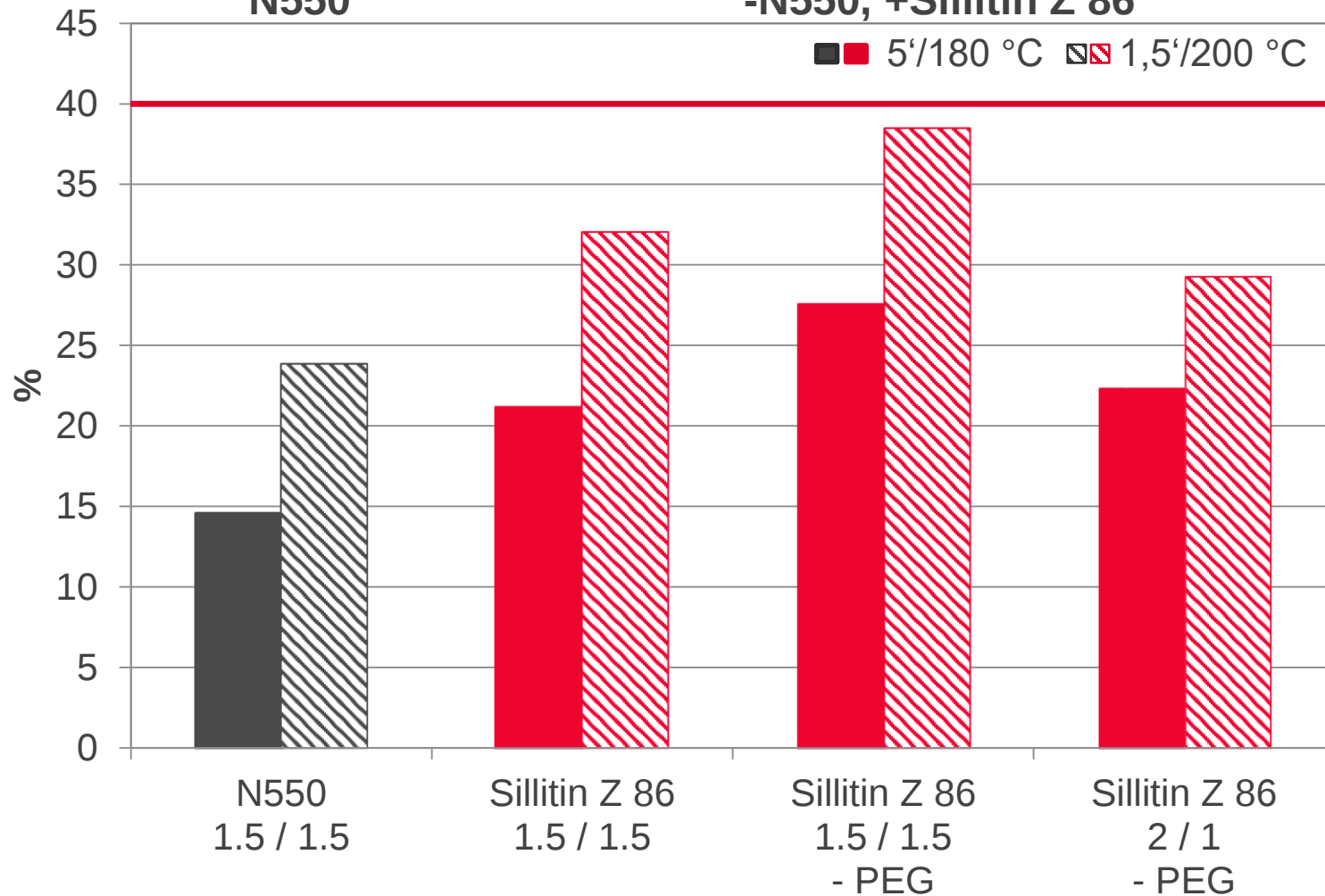


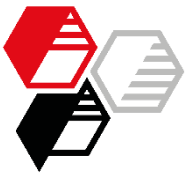
Compression Set

DIN ISO 815-1 B, Cooling Method A, 70 h / 70 °C

N550

-N550, +Sillitin Z 86

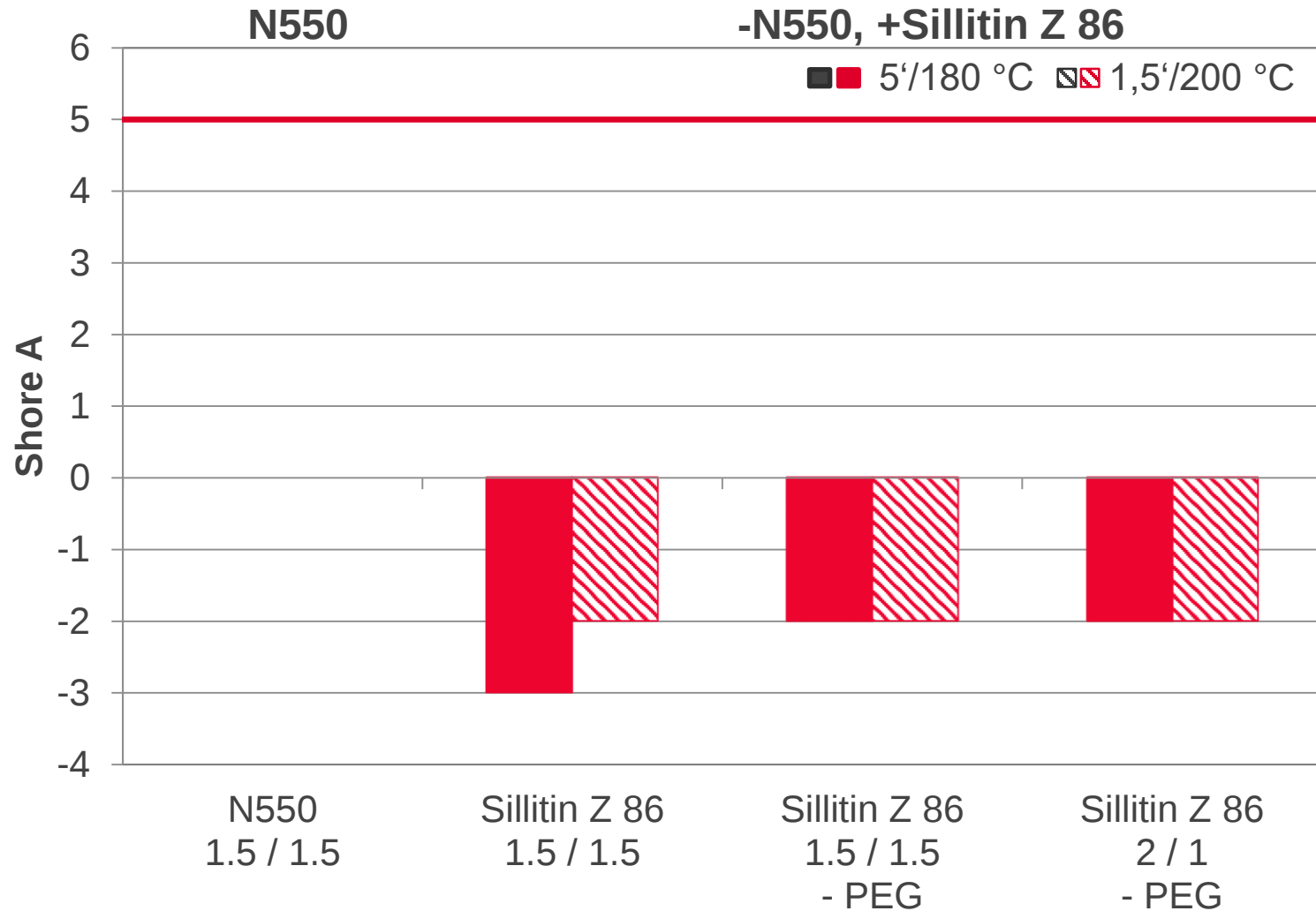


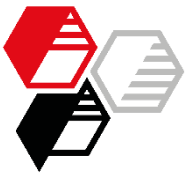


Storage in Dist. Water Change of Hardness

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28 d / 70 °C

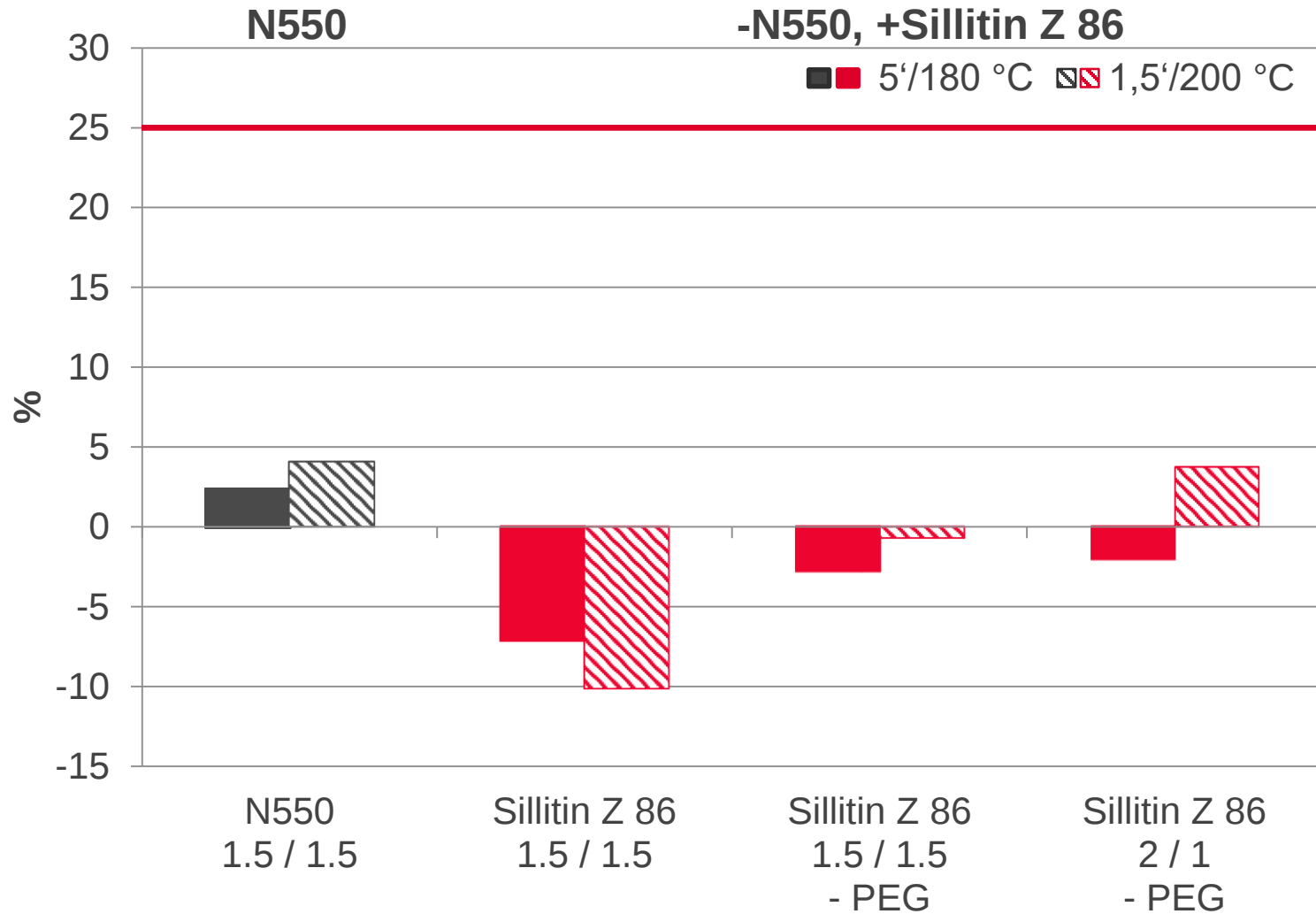


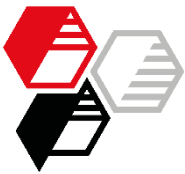


Storage in Dist. Water Change of Tensile Strength

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28 d / 70 °C

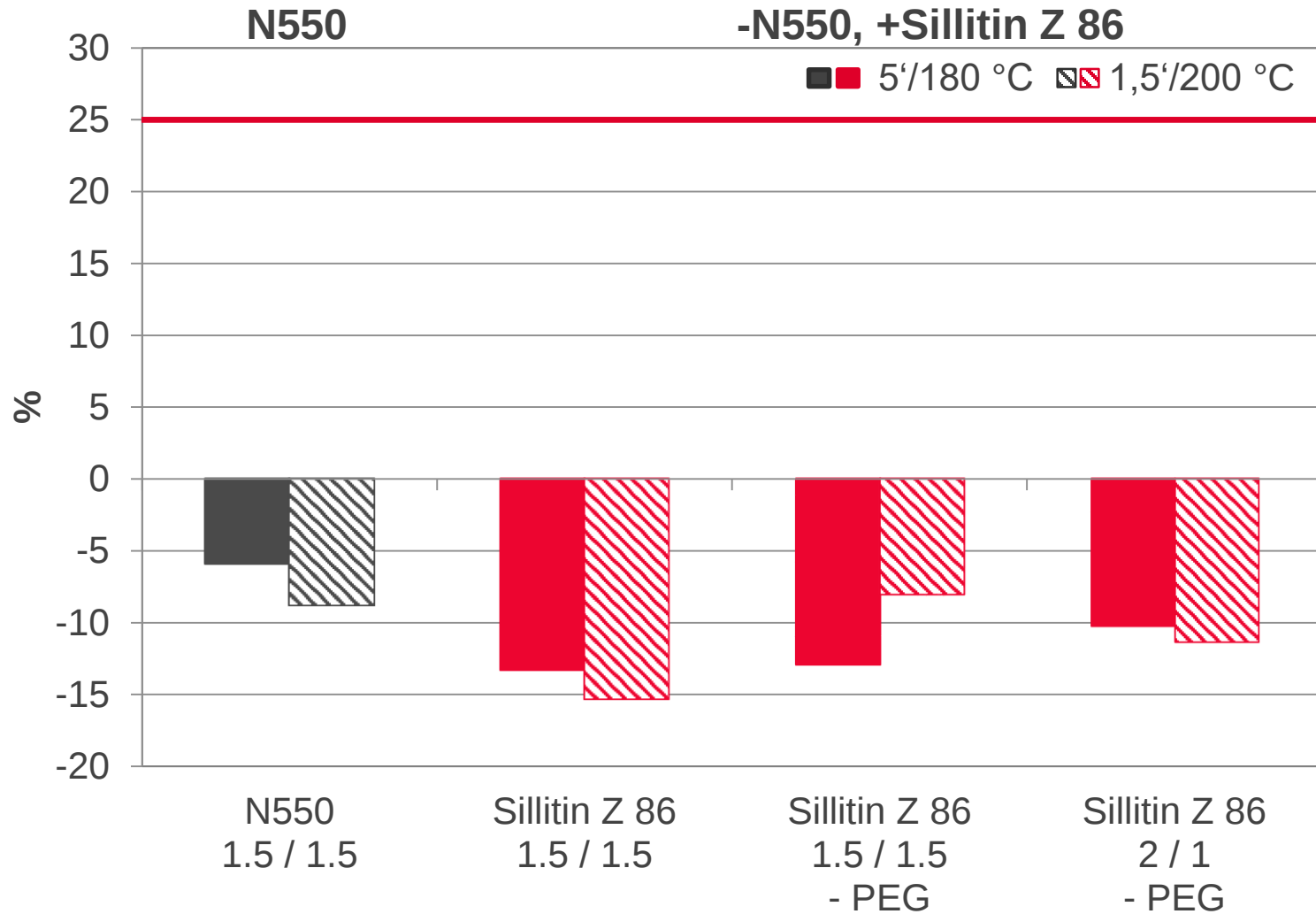


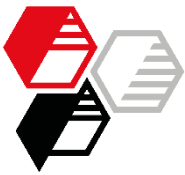


Storage in Dist. Water Change of Elong. at Break

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28 d / 70 °C





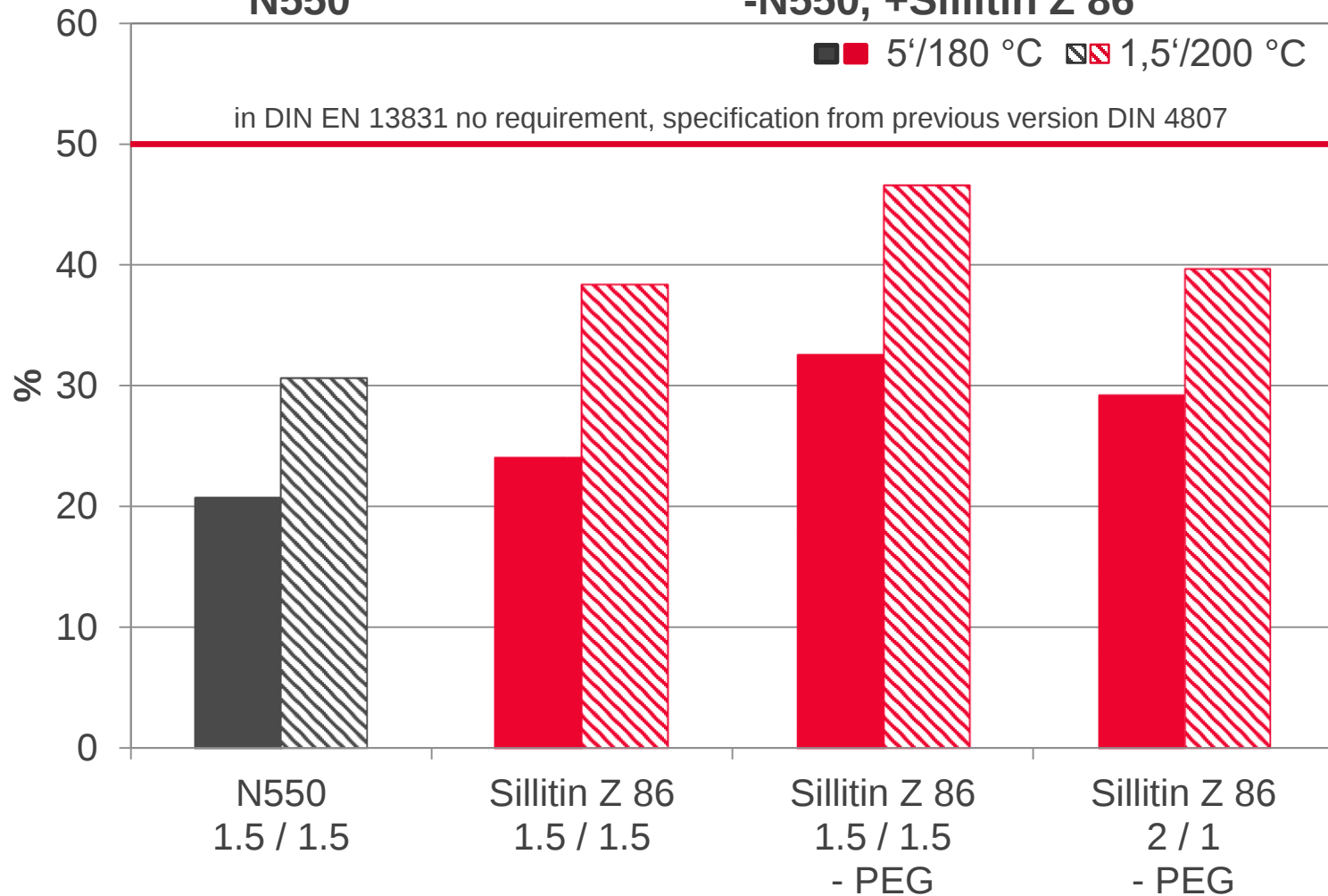
Storage in Dist. Water Compression Set

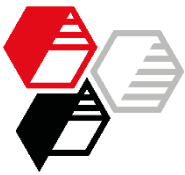
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DIN ISO 815-1 B, Cooling Method A, 28 d / 70 °C

N550

-N550, +Sillitin Z 86

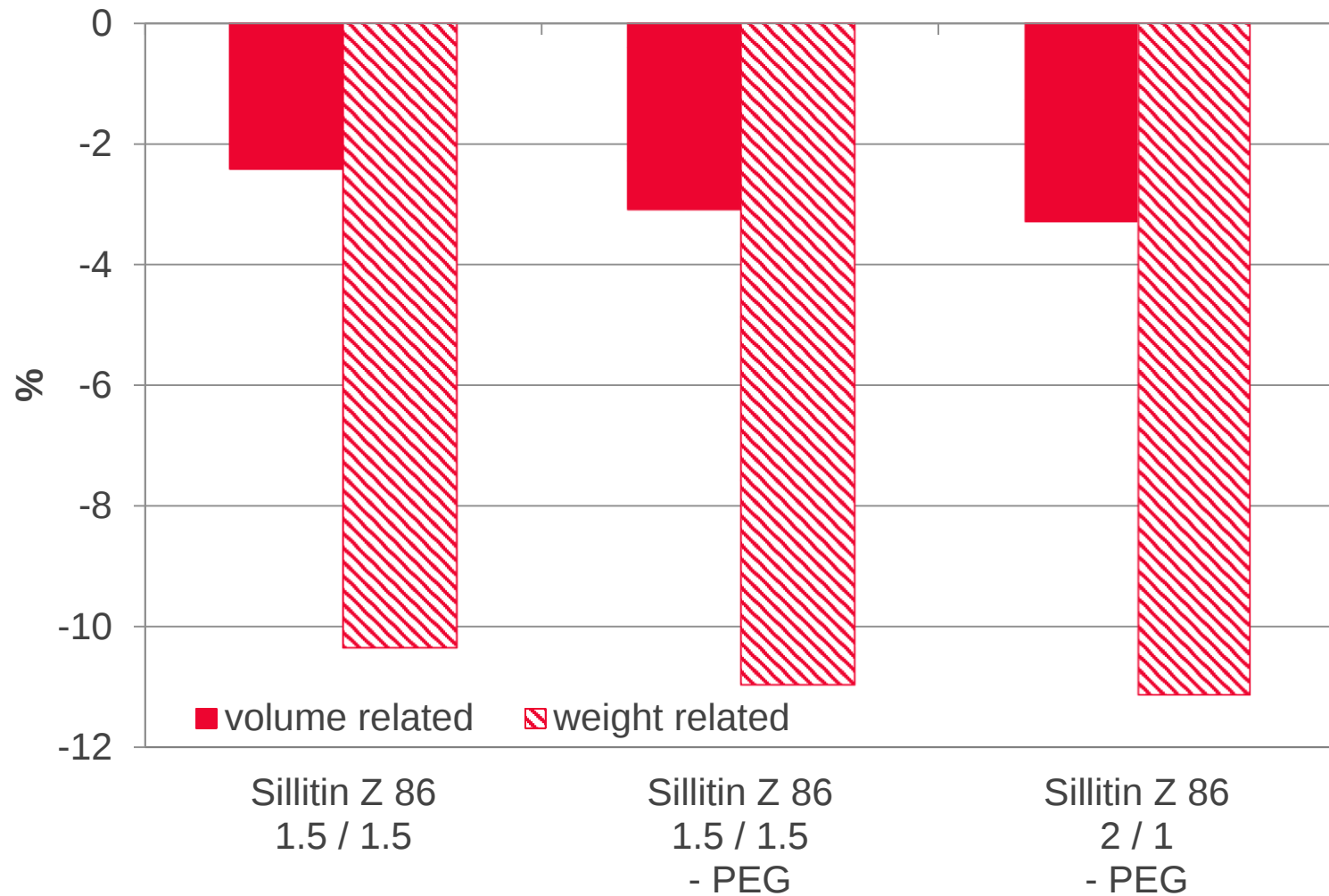


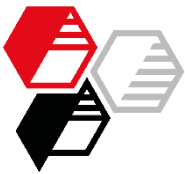


Compound Costs Versus N550

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Germany, 2015





Conclusion

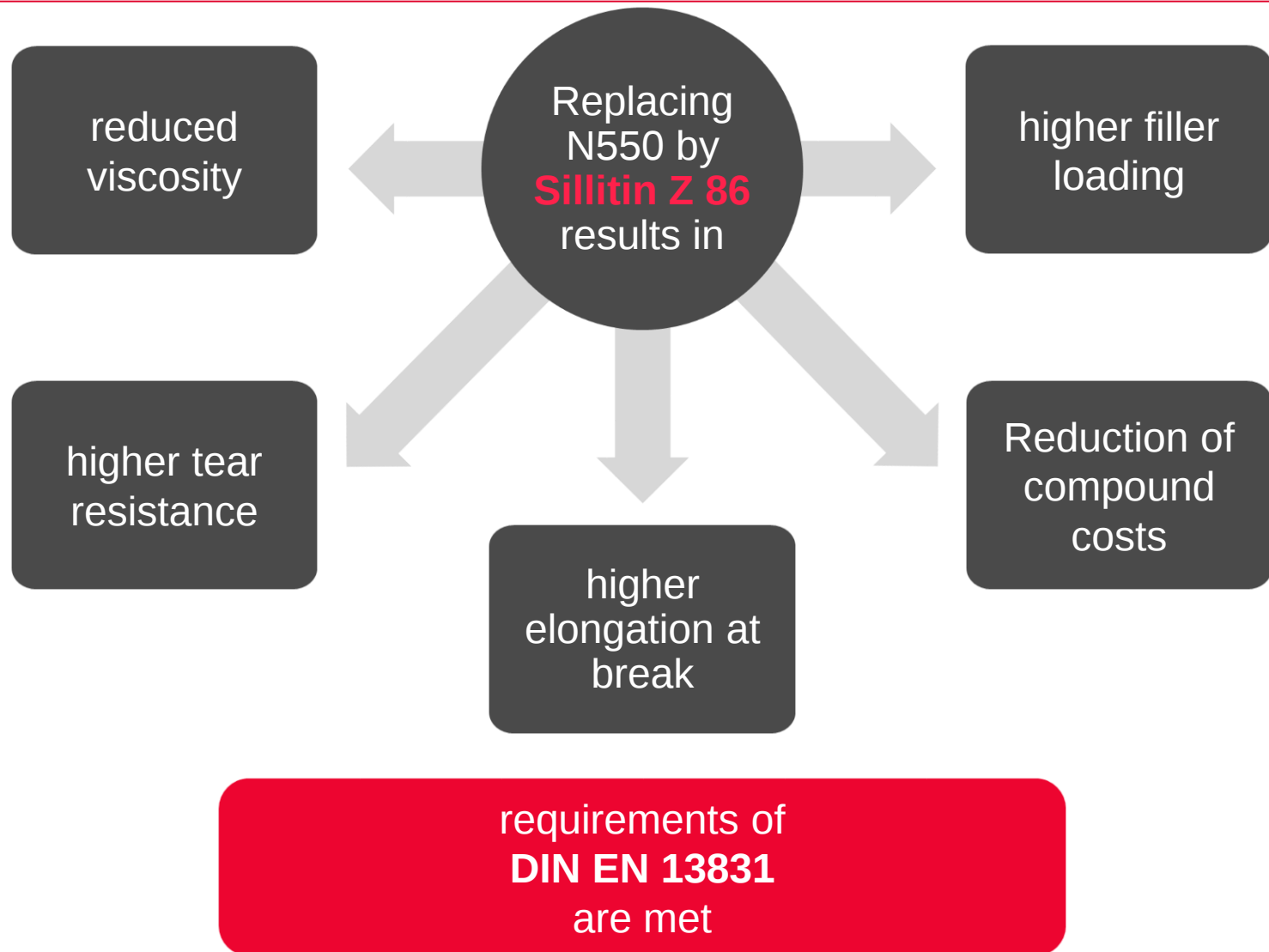
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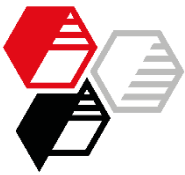
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We supply material for good ideas!

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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